THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

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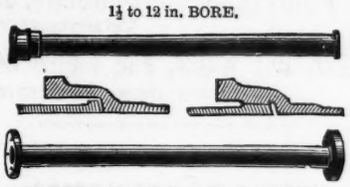

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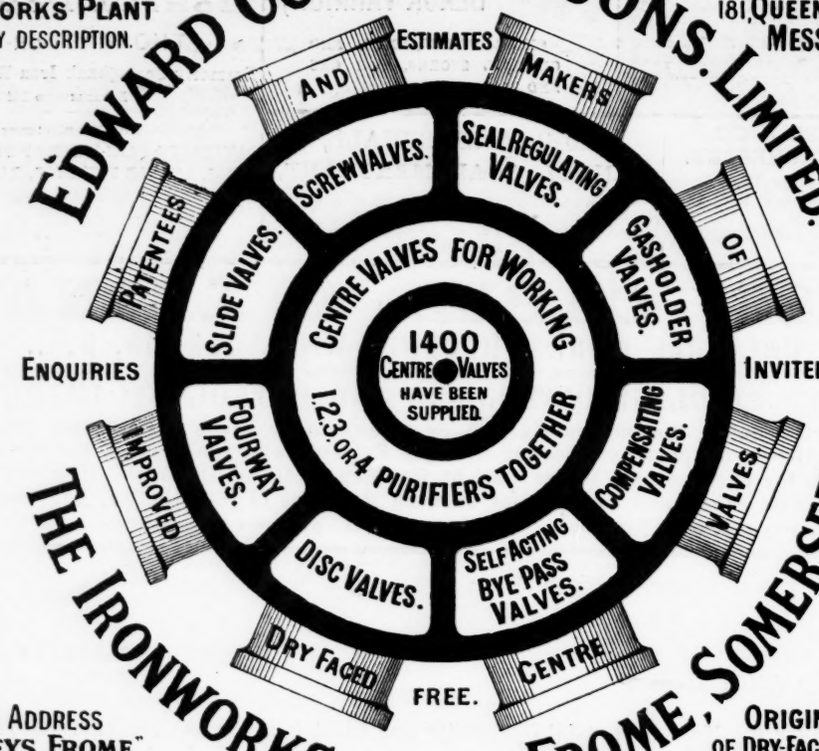

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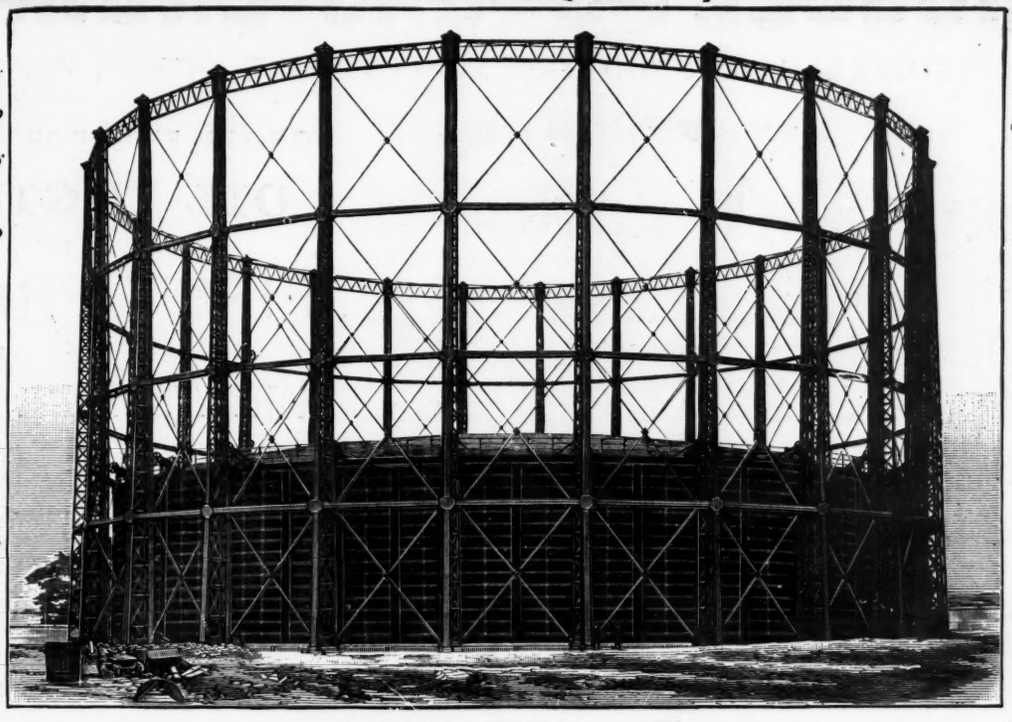

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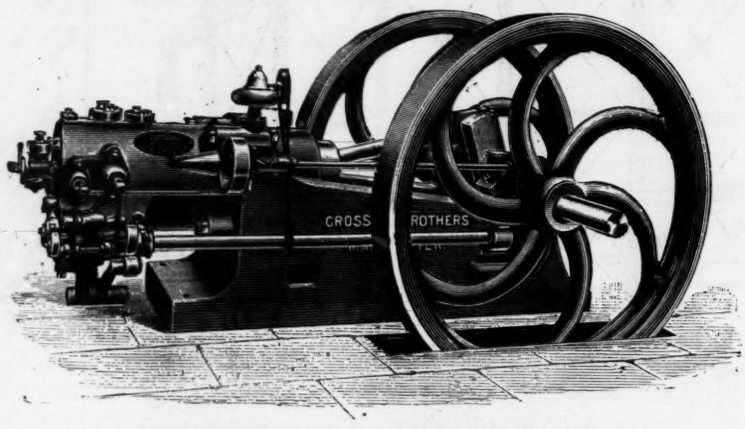

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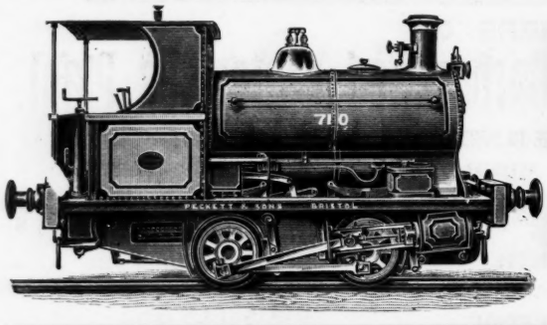

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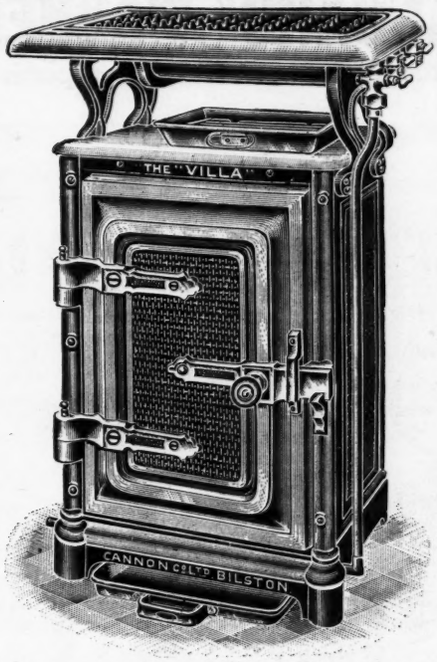

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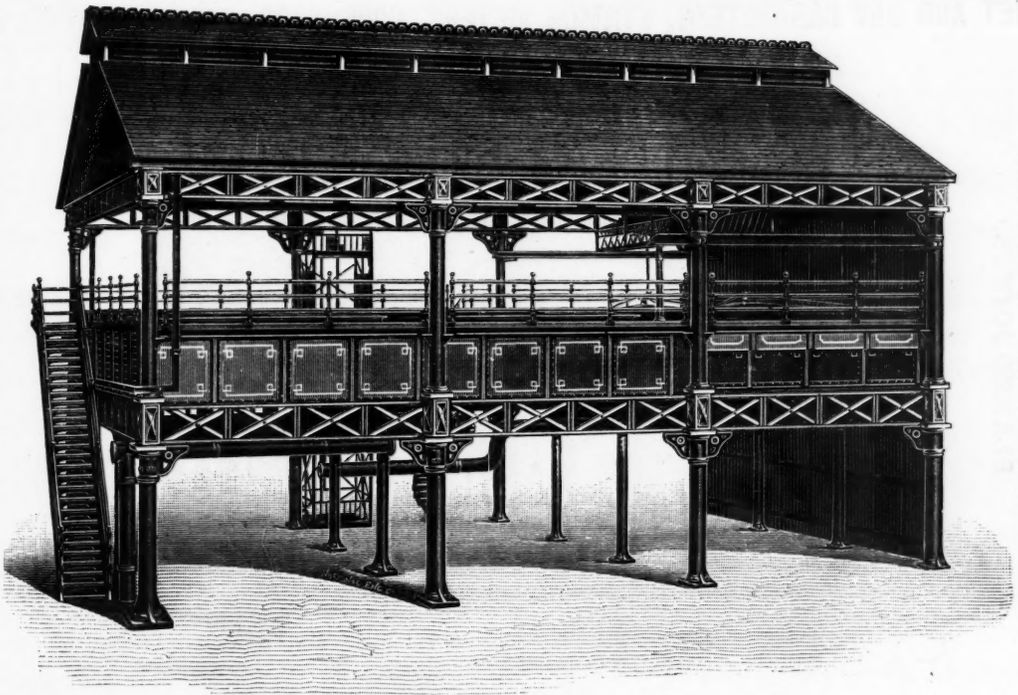

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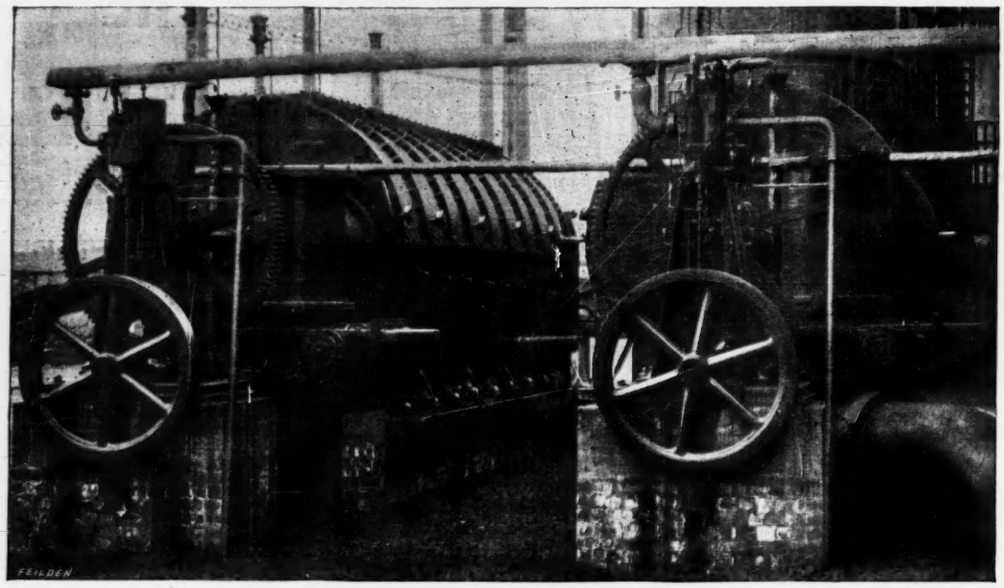

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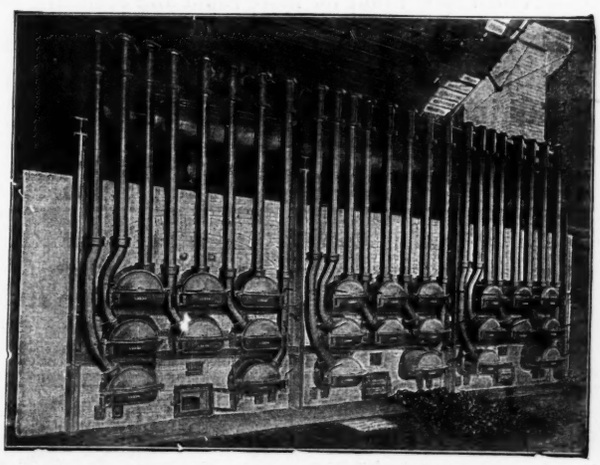

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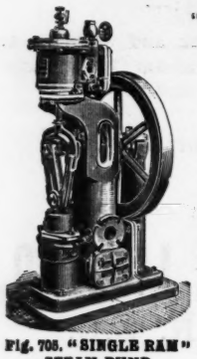
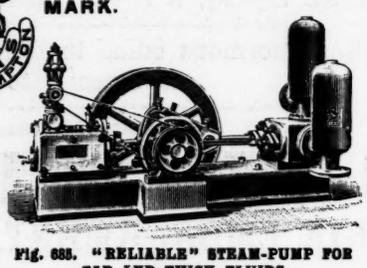


Fig. 705. "SINGLE RAM" STEAM-PUMP.

Fig. 802. "CORNISH" STEAM-PUMP FOR BOILER FEEDING, &c.



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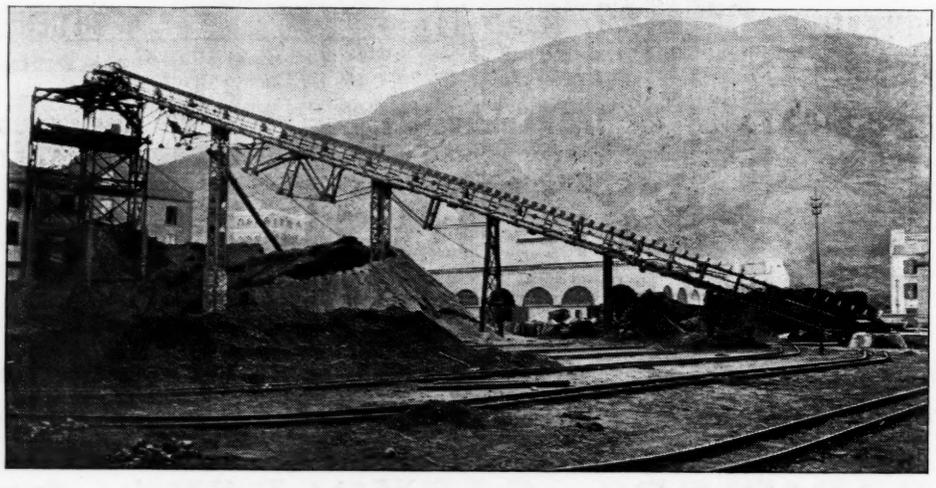

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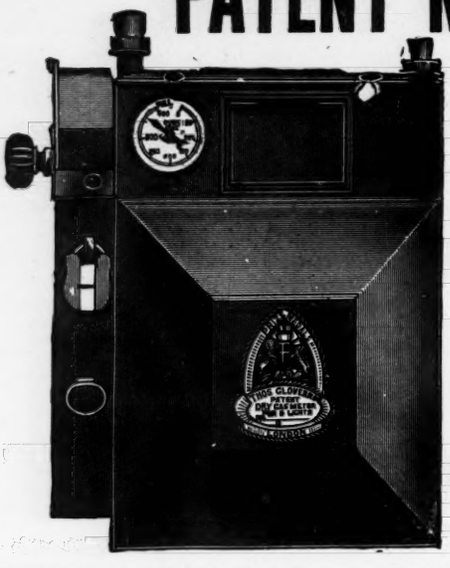

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EDITORIAL NOTES.

What is the Load-Factor of a Gas-Works?

THIS is a great Age of Word-Making. It is consequently a busy time for dictionary compilers and encyclopædists, whose productions are offered to the public on every side in terms of such impassioned commendation as have hitherto been exclusively reserved for the use of patent medicine vendors. If only a moderate percentage of what one is told of the results of these appeals is true, the sages of Laputa would cut a poor figure in a *vivâ voce* examination on things in general against the English-reading peoples of the present generation. Every new dictionary that bids for a home with an English family, on the easiest of terms—as if it felt itself to be a superfluous piece of furniture—claims to contain so many thousands of words more than any of its precursors; and it must often have occurred to ordinary people to wonder where all these additional words come from, and who uses them. Such curiosity is quite excusable, seeing that the English vocabulary in common use does not seem to grow at anything like this lightning speed. The explanation is that all these fresh dictionary words fall broadly into three categories. The first contains the archaic, the obsolete, and the ephemeral words which persevering hunters of such game find in old writings. The collection of them is a useful work when done with judgment, because one never knows when it may be necessary, for legal or other purposes, to hunt up the proper significance of some strange written expression. The second category contains as many as the exigency of the date of publication permits of those novel, vivid terms for common things which are called "slang" by the polite, but are really language in the making. The third category is composed of the new scientific and technical words, which the necessities of an ever-growing science and technic continually inflict upon us.

People living in the world, readers of newspapers, do not need any ponderous dictionaries to instruct them as to the meaning of slang words; but it is different with current science and industry, and the terminology of the things appertaining thereto. Scientific men and technicians are in the habit of making up their language as they go along; and this is the only possible way, for there is no emporium of words to which a man can apply for a term applicable to the new thing he wants to describe and talk about. Men engaged in the same science and technic understand one another's language, even as soon as it is expressed; but there is always an interval before the general public get to hear the new terminology, when they naturally want to know what it means. It is by that time useless to look up the writings in which the strange expressions occur to find the requisite explanations, because they have so long passed current with the experts that nobody thinks it necessary to define them. Consequently, the ordinary reader hies him to his costly encyclopædia, or his voluminous dictionary, only to discover to his chagrin that the much-vaunted authority is silent on the subject. Then, perhaps, the purchaser of the monumental work bethinks himself, with regret, of the date of the original appearance of the book.

The expert finds his opportunity in this silence of the great dictionary on the subject of which he is a repository of the latest information. It is useless to take an encyclopædia into Court when it is a question of the amount of existing knowledge concerning a point of electro-chemistry; though it is a common practice for the Courts to consult a dictionary for the ordinary and accepted meaning of the language used in a patent specification. This failure of encyclopædias and text-books to keep up with the unresting march of progress is the inherent weakness of their race. It is one reason why a publication of the kind ten years old can generally be had cheap. It is rarely worth its price.

We have been led into these reflections upon dictionary information by thinking over the present position of the old familiar question, in gas supply, of differential prices. It was discussed the other day at Vienna, and it will be discussed again wherever gas managers do congregate, for the reason that the experience of the rival industry of electric lighting has put a fresh aspect upon the whole matter. This discovery is capable of being summed up in the one expression, "load-factor," which hitherto has been rather felt than talked about in the gas industry. We do not know how many encyclopædias and dictionaries contain and define this expression, but should feel, upon perceiving it in such a work, that the author or compiler had distinctly "scored." Many dictionaries, doubtless, contain the roots of it. One that lies open before us gives, for one meaning of the word "load," the amount of work done by an engine working up to its full capacity—a very good definition. On the same authority, "factor" means one of several circumstances, elements, or influences on which a certain result depends. The word also means, in arithmetic, of course, the quantities that go to make a multiplication sum. Algebraically, it bears a similar, but wider, meaning.

The load-factor of a productive plant is not defined in this dictionary. It grows out of the definitions of the two component words already given; but the term has been framed to signify a particular attribute of the subject, having reference to a time-limit understood, which is not explicitly conveyed by them, separately or together. It is the term applied to the proportion borne by the actual output of a plant to the maximum possible output calculated over the same time. Taking the maximum possible output of any plant, or a machine, for any stated working period—a day, a season, a year—as 100, then the realized output of the plant or machine for the same period will be a percentage of the maximum. If the plant works at full load half the time, it will have a load-factor of 50 per cent., and so on.

Simple as this relation is, and wide as are its possible applications, it was left to the founders of the electric lighting industry in this country to formulate, as they had the fortune to feel, the inconvenience of the working condition which was quickly perceived to attach to the realization of a low load-factor. Having no means of storing their output, they were obliged to produce their electricity from hand to mouth; and it was soon ascertained that this is a very extravagant way of carrying on an artificial lighting business in these latitudes. Theirs was, and is, the case of the lodging-house keepers of a watering-place with but a limited "season." Only the other day, the engineer of a very large provincial electricity supply undertaking confessed that his sales for last year were not more than one-sixth of the real working capacity of his plant. This is bad business. The most sanguine hypothetical tenant of a farm would experience a difficulty in deciding what rent he ought to pay for an estate which only bore a full crop every sixth year.

The manner in which the administrators of electricity supply undertakings have faced their invariably low load-factor is an interesting study, which we have often commended to gas engineering readers, but cannot enter into now. Usually, their policy has been guided by local conditions, when they have had the ability to judge for themselves and have not blindly followed a fashion. The first question they have asked themselves has been as to the existence in their areas of any possible applications of their product, other than lighting, which might be worth encouraging in order to improve the low load-factor inseparable from the latter class of business. Where this question has anything distantly resembling an affirmative answer, the branch has been exploited in various ways—we are not concerned to say with what result. In other circumstances, the low load-factor has been accepted as an unavoidable necessity, and the supply charged for accordingly. It is all a matter of price. The load-factor largely determines the amount of the fees of a Patti, as it does those of a Leader at the Bar, and the price of a tramcar ticket.

The means by which the possibility of enlarging the load-factor of an electric lighting plant is most readily explored is a highly-attractive differential price. It is in this respect that those who are at present reviving the question of differential prices for gas supplies are inclined to pose the economical problem for fresh consideration. What is the load-factor of any particular gas-works; and what are the local prospects of improving it, if unfavourable, by a marked "cut" of selling prices? This is a very different problem

from that of the old discussions upon "Uniform *versus* "Differential Prices for Gas," which were popular diversions of gas managers many years ago. The difference lies in the matter being given a particular, instead of a general, application. The factors that enter into it are never the same in two places. The load-factor is one of these variables; but the local possibilities that must be considered before the increase of any particular load-factor can be deemed attainable, are of even greater importance. It is tolerably safe to assume that existent possibilities of this kind have nowhere been exhausted. There are many reasons for this. One is the habit of gas undertakings of adopting one another's practice in business, without much original inquiry. It does not at all follow that the business practice of a big gas undertaking is the best guide for that of a smaller concern, even in the same neighbourhood. The case of the London Gas Companies is typical of this. They have nothing to gain by making heavy reductions of charge for particular lines of business, even if they could legally offer them, because there is no large manufacturing or other special field awaiting their exploring energies, which must, consequently, be restricted to other outlets. It may be, and is, the precise opposite in some other places.

The above is, shortly, the reason for the reopening of the question of differential prices for gas sold for various applications, which is one of the points of the practical gas politics of the day at home and abroad. Where reasonable grounds exist for trying the experiment, it will not be a matter of allowing, as of old, a fancy discount, limited to 10 or 20 per cent., but of offering the service at a reasonable figure based upon its calculated cost. Electricians have made "shots" at their special figures, frequently ignoring altogether the cost of production—only aiming at cutting out some other available service. This is cut-throat competition, not sound business. Happily, there is so little trade done, even at these "alarming sacrifices," that the financial situation is not greatly affected thereby. There is precedent for this special price-computation, of a kind, in the statutory provisions regulating the price charged by certain gas companies for supplying automatic meters and fittings. This has to be limited to the actual figure at which the extra service can be performed, without putting an unfair burden upon the other class of consumers. The principle is capable of being developed. Here the discussion, which began in the House of Commons Committee-rooms this session, may be regarded as having reached the stage when further information is desirable; and we shall therefore be very glad to hear from any British gas manager, giving his valuation of the load-factor of his works. It is a figure that, so far as we can recall for the moment, has not been published for any gas undertaking.

The Terms of Coal and Coke Contracts.

THE case of "Moore *v.* The Nuneaton Gas Company," which will be found reported in our "Legal Intelligence" to-day, contains some matters of general interest to gas companies and coal and coke dealers. There were cross claims between the parties, who stood to one another in the double position of contractors for coal and coke. The plaintiff, who sued for damages in respect of the non-delivery of some coke sold to him by the Nuneaton Gas Company, was counter-claimed for non-delivery of coal under another contract. The latter question was decided first. By the terms of the contract, the coal was to be delivered in monthly consignments; and it bore at foot the words, "above quantity "may be increased or reduced by 10 per cent. at buyers' "option, on giving notice of their intention to do so." The total quantity of coal named in the contract was 3000 tons; and the Company contended that it was to this quantity that the option to increase or diminish applied. At all events, six months after the commencement of the contract, the Company gave notice to increase the delivery as provided for; but the contractor contended that his obligation was limited to the quantity then remaining to be delivered, and not over the whole amount. It was a perfectly natural dispute in the circumstances; but the Court held that the Gas Company's interpretation of the contract was the correct one. The coke case was a question of boats or waggons. The Gas Company pleaded that there had been no breach of contract on their part; but that whenever the requisite boats and waggons were sent to take the coke, it had been loaded up. It seems remarkable that those who might be regarded as enjoying a beneficial contract for the supply of coke at a cheap rate did not avail themselves of it to the utmost; but so it appears to have been in this instance. The behaviour of the coke contractors of the Nuneaton Gas Company would have appeared impossible to the founders of the Utilitarian School of Philosophy; but it happened, all the same. There must have been reasons for it; but they were of those things that are not dreamt of in this philosophy.

Irish Private Bill Procedure.

AN interesting debate was held in the House of Lords on Friday on the motion for the second reading of the Bill for cheapening and expediting the procedure for Irish Private Bills. This was the inevitable replica of the Scotch Act, which came into operation this year, and has the reputation of working satisfactorily. It is open to the obvious objection that scarcely enough time has yet elapsed to enable the value of the new Scotch procedure to be accurately gauged, and therefore that to copy it now would be premature. On the other hand, there will need to be so many and such radical adjustments of drafting to make the Scotch Act applicable to Ireland, that the work can scarcely be begun too soon, if legislation on these lines is to be undertaken in the course of another session or two. So much is agreed among those who approve of the principle. Behind these difficulties of form, however, there lies an objection which will be heard a great deal of whenever such a Bill is tabled. The financial and industrial arrangements of Scotland and Ireland are not on an equal footing. To put it shortly, the process of municipalizing statutory undertakings has gone much further in Scotland than in Ireland; and consequently it is safe to entrust Scotch Local Authorities with a cheaper and easier way to procure Acts of Parliament than it might be politic to place in the hands of the less businesslike and more faction-ridden Irish bodies. For this very reason, the details of any Irish Bill having this object will require most careful examination by those who are responsible for the safety of the private interests it might possibly jeopardize.

The Case of the Cork Strikers.

A MOST remarkable termination has been arrived at in the matter of the proceedings taken in the Cork Police Court by the Gas Company against the men who left their employment without notice, and thereby began the strike which has since had such sensational developments. A good deal used to be said in the early days of Home Rule about the desirability of ruling Ireland according to Irish ideas; and it was roundly asserted that none but Irishmen are conversant with this order of ideas in respect to affairs of government. The proceedings now in question appear to be an excellent illustration of this contention; for certainly an ordinary Englishman must find it difficult to follow the train of reasoning which guided the Cork City Bench in their dealings with the Gas Company's rebellious workpeople. The hearing of the charges against the men has dragged through a considerable time, which is not altogether a disadvantage when popular feeling is deeply stirred. The law can usually wait for passions to die out. Last time the cases were before the Court, however, the Bench (over which the Lord Mayor presided) adjourned them in order that information might be procured as to the terms of contracts subsisting between gas workers and gas companies in England and Ireland. A more extraordinary and fantastic notion surely never carried away the mind of any reasonable man entrusted with the administration of the laws. As if it could, by any conceivable stretch of the judicial imagination, make the smallest difference to breakers of a contract that there are other contracts in existence with which they have nothing to do.

When the cases came on again, the legal adviser of the Gas Company very properly argued that the Court would stultify any judgment they might pronounce, by previously admitting bad evidence. He therefore declined to be a party to any such travesty of judicial proceedings. The other side thereupon ostentatiously proclaimed their readiness to admit any evidence, legal or illegal; and the Lord Mayor appeared quite disposed to be equally amiable at the expense of the reputation of the Court. The other occupants of the Bench, however, had more backbone; and, after some controversy, the illegal evidence was excluded. Then the Magistrates retired, and seemingly the majority, having gained their point on the question of the evidence, were content to sink matters of fact. The Bench accordingly screwed their unanimity up to the point of declaring that the accused men had acted extremely badly, but proceeded to admit disagreement as to the precise nature and binding force of the contract of service which the men had broken.

Consequently, the two delinquents charged were given the benefit of the doubt, and the charges against them were dismissed "without prejudice"—whatever that may mean in the circumstances. Thus the whole proceedings were dropped with the same.

Comment fails before such a record. If there is a scrap of moral to be extracted from this story, it is that those who have to do with the engagement and pay of gas workers should not only possess the clearest knowledge of the conditions attaching to the employment and the legal consequences of wilful breaches thereof, but should see to it that their men know as much of the same as is necessary and good for them. After all that has passed in this regard, it is little short of scandalous that a shade of ignorance should remain anywhere in respect to the legal relations of employees and employed in the statutory gas industry of the United Kingdom of Great Britain—and Ireland.

The Postponement of Educational Reform.

THE postponement of the instalment of educational reform contained in the Bill introduced by the Government, and now dropped for want of time, is (to those who recognize how greatly our educational methods require overhauling) very disappointing—not so much on account of the intrinsic value of the Bill, which required considerable amendment, but because of the proof thereby given of the failure of our statesmen to realize how much we are at present hampered as a nation by the chaotic and unsatisfactory condition of the educational arrangements in this country. We cannot speak of them as a "system," for beyond the Board Schools there is none. If they had had their hearts in the work, and any zeal for improvement, surely the Government, with an enormous majority behind them and a singularly feeble and inconsiderable Opposition before, could have made time for the passing of their measure. Party politics are not known in these columns, and so we shall not be misunderstood when expressing the regret that every business man must feel that the really pressing need for putting our house in order, in view of the keen competition with which British industries must contend in the future, obtains so slight a recognition from those in charge of the nation's affairs.

The question should not, indeed, be a party one at all; and we wish that the business men on both sides of the House of Commons would unite to first urge its importance upon the Government, and then to facilitate the progress and work for the perfecting of any measure calculated to improve the present state of affairs. As we have said before, it is high time that business men took in hand this question of our educational needs—not only in Parliament but outside, where much can be done that legislation cannot effect. The primary difficulty is to persuade these business men of the necessity for better educational facilities, because so many of them fail to appreciate the commercial value of science. They have a strong prejudice (not without basis) in favour of the "practical man" as compared with the student—failing to perceive that the best practical man is he who possesses sound theoretical knowledge before he begins to acquire the equally essential practical experience.

We may here call attention to one of the weakest points in the ideas prevailing in this country in regard to technical education. It is a fallacy leading to the wasting of the greater part of the money annually expended under this head—the idea that what is wanted is for all our workmen to have a smattering of science, an elementary knowledge of the technics of the industry in which they are engaged. What we really need is a comparatively small number of highly trained, scientific and practical men to put in charge of, and direct, the workpeople. We want expert captains, not imperfectly educated privates; scientific engineers, not stokers with just a vague notion of the chemical processes involved in the carbonization of coal. As a writer in the current "Monthly Review" puts it, "technical education "as at present carried on in this country, at a cost of over "£1,400,000 per annum, is chiefly instrumental in giving "to great numbers of young people *elementary* instruction in "every subject excepting the dead languages."

What then our business men should aim at obtaining is first of all the concentration of our higher educational facilities, so that the money now spent upon producing a large number of smatterers might be used to provide completely equipped institutions where a smaller number of men, of proved ability, could be turned into highly-trained experts. This is the principle upon which our German friends have worked, with a success known to all men. They have not so many technical institutes as we have; but those they possess are magnificently equipped and staffed, while young men who have shown that they are capable of profiting by the instruction there to be obtained are, if necessary, assisted to obtain it. Having achieved this concentration of energies and funds—a policy to which much opposition will be offered by the teachers at the small local Technical Institutes and Board Schools—our business men must see that more funds are forthcoming, from either public or private sources. Above all, they must create a demand in their own industries for highly-educated men. They must make it clear that there is plenty of room at the top, and plenty of money for those fitted to be put there. The nation has a stiff battle to fight with German and American competitors; and the gas industry has to fight the battle against electric light and other rivals. The struggle grows rather than diminishes in intensity. Will our business men rise to the occasion, or are we Englishmen to go on indefinitely "muddling through"?

The Constitution of Royal Commissions.

COMMENTING upon the recently issued report of the Local Taxation Commission, the "Spectator" calls attention to the very unsatisfactory constitution of many of the Royal Commissions that have been appointed in recent times—a constitution that renders them of exceedingly small value as instructors of public opinion. The fault lies in the modern practice of putting upon a Commission appointed to inquire into any subject, well-known representatives of the extreme schools of opinion concerning it—representatives who are foredoomed to disagree upon a verdict, and who approach the consideration of facts and evidence with hopelessly prejudiced minds. What possible practical result would accrue from the appointment of a Commission to investigate the origin of the Boer War, with (say) Mr. Chamberlain, Lord Milner, Mr. John Morley, and Mr. Labouchere on the list of members? No one would expect them ever to agree upon a report. And yet Commissions have been appointed in recent times equally well (and no better) constituted to arrive at a unanimous opinion, acceptable to the public for its guidance. That is to say, "instead of appointing four or five impartial "[and competent] men to act as a kind of jury, to hear the "witnesses, and come to a conclusion, we now place all the "chief witnesses for both sides on the Commission itself, and "leave them, as it were, to shout each other down." Instead, therefore, of feeling it to be their prime duty to ascertain the actual truth and the wisest policy, the members of a Commission look upon it as their sole duty to advocate and report in favour of the policy which they supported before the "inquiry" was instituted.

The result is that, as in the case of the Local Taxation Commission, we get not a report but "a welter of conflicting views," which confuse instead of informing the average layman, who, feeling incapable of arriving at a proper judgment for himself on such a complicated question, requires an informed and definite opinion upon which to take action. The report of a Royal Commission should be, in fact, in most cases a kind of "counsel's opinion" upon which the nation would feel safe in acting. Another result of the present system of constituting Commissions is that, as the members do not anticipate that legislation will be framed according to their report, they tend to deal with their subject academically, instead of from a practical point of view. As the "Spectator" says, the old Commissions acted throughout on the supposition that their recommendations would become law. They accordingly reported, "with that full sense of "their responsibility which alone comes from the belief "that one's advice is going to be put into practice. The "modern Royal Commission clearly does not feel any such "responsibility. Every page of a modern report shows that "those who report view the matter in a more or less aca-"demic light." That this is so cannot be denied; nor that it is a great waste of time as well as of money to institute such inquiries.

We trust that the proposed Royal Commission on Coal will be formed upon very different lines, so that the report may be respected by everyone. It would be as absurd to put coalowners on the Commission as it was to put representatives of "the trade" on the Licensing Commission. Let us have independent investigators of admitted competence and unquestioned fairness; and then let all the interests concerned—the coalowners, lessees, and miners, the shipping trade, and the principal consumers—appoint their representatives to present their facts and arguments.

Let the economists be heard, and let the geologists prepare their estimates. Mining engineers must state their opinions as to the depth at which coal can be extracted, and at what probable cost. Evidence will be required on very many other points, and can be obtained. Then let the Commissioners weigh the evidence, sift and consider the facts, and present to the nation a full report containing reliable information and practical recommendations. We do not want a bundle of differing opinions, over which the wrangling of conflicting interests would continue unabated. We hope that the Government will secure such an inquiry as we have outlined; but the grounds of hope are slight, judging by the experience of recent years.

WATER AFFAIRS.

Mr. Long on the London Water Question.

When offering, in the "Journal" a fortnight ago, a few observations on the position of the London Water Companies, we thought the subject might well be left until the scope of the Government measure dealing with the Metropolitan Water Question should be made known. Two events have since occurred which necessitate further reference to it. The first is the announcement that a private Member of Parliament—Sir Blundell Maple—has anticipated the President of the Local Government Board by preparing a Bill on his own account; and the second is the important speech on the general question made by Mr. Long at the complimentary banquet given to Mr. Harry Samuel, M.P., at the Café Monico last Wednesday. There was no special reason for referring at any length to the subject of the London Water Supply in responding to the toast of "His Majesty's "Ministers," seeing that the public affairs of the moment would have afforded Mr. Long plenty of scope for after-dinner oratory. But possibly the knowledge that there was another Richmond in the field led him to take the opportunity of making it publicly known that the promise held out by the Government to deal with the Water Question next session was not an empty one, but was made with the full intention of being redeemed. It will be seen, from the report of Mr. Long's remarks which appears elsewhere, that the Government believe the measure they will introduce will meet all requirements, and therefore they intend to do their utmost to have it placed upon the statute-book. There was an absence of hesitancy—in fact, an unmistakable straightforwardness—about Mr. Long's utterances which was quite invigorating. Here is a problem which calls for solution. It would have been solved long ago had a certain public body realized the magnitude of the question, and their own unfitness to cope with it. But they did not; and, consequently, their proposals had, one by one, been rejected. The Government mean to settle the matter "in an equitable and "generous spirit," in such a manner as to make it "a final "settlement." We may well say, "For this relief, much "thanks;" for, in all conscience, the problem has been awaiting solution years enough. Mr. Long recognized that there would be some difficulty in arranging different interests; and he was careful to point out that there must be material concessions—a give and take—if the matter is to be brought to a successful issue. Especially will an exhibition of this spirit be called for in respect of the outside districts. They will not, as we gather from Mr. Long's remarks, be asked to sacrifice themselves in the interests of the Metropolis, but merely to appreciate at their real value the enormous benefits they derive from its proximity, and to recognize that these benefits carry responsibilities with them. This, then—a little mutual concession—appears to be all that is needed for the settlement of a question which has for so long troubled London. It is to be earnestly hoped that the efforts of the Government will be supported in the spirit indicated by the President of the Local Government Board, and that the outcome of their labours will be the constitution of "a body of "weight and importance" for the control of the whole of the water supply of London, and one which shall be "fairly and "justly representative of all the interests of the population." Where that spirit is absent, Mr. Long warned his hearers that the objectors would have to give way to superior forces, for the measure would have to be carried in spite of them. The warning should not be unheeded.

Resignation of Sir Alexander Binnie.

One of the most important announcements which have been made of late years to the London County Council, was that which came before them last Tuesday in the report of the General Purposes Committee. A letter—short, and strictly to the purpose—had been sent to the Chairman of the Council by Sir Alexander Binnie, intimating his intention, as mentioned in the "Journal" last week, of resigning his position as Chief Engineer, in order to commence private practice, which would, of course, be incompatible with the tenure of the office he now holds. He left with the Council the fixing of the date of the severance of his connection with them, in order that the public service might be interfered with as little as possible; and the Committee recommended that he should be released at the end of the year. The announcement was received with general expressions of regret at the step which the Chief Engineer had decided upon taking; but they were practically lost in the encomiums passed upon him—and most deservedly. He came to the Council with a fifteen years' record at Bradford; and for the eleven years he has been in London he has devoted himself zealously to their service. The work done has brought him well-merited professional and social distinction; and if it has not comprised some with which he would have been gratified to have his name associated, the cause must be sought in the operation of circumstances which neither he nor the body he served could control. If the projects upon which the authorities at Spring Gardens are likely to be engaged in the future presented to Sir Alexander only a comparatively restricted sphere for the exercise of his unquestionable abilities, we can perfectly well understand his desire for the wider field which private professional practice will give him. We can also understand that the desire is mingled with some disappointment at the non-success which has attended the action of the Council on the Metropolitan Water Question. That this should be the result of eleven years of arduous labour on their behalf in every tribunal before whom the Water Companies have been arraigned, is not due to any lack of ability in the preparation of the attack, but to the unimpeachableness of the parties accused. We venture to think this conclusion is justified by the language used in the report of the last Royal Commission. It will be difficult, as was recognized by some of the speakers on Tuesday last, to replace Sir Alexander Binnie; but the difficulty will not be insuperable. Moreover, it may be presumed that, should occasion arise, his advice, as a consultant, would be available to the Council. In any event, ability such as that possessed by their present Chief Engineer is not likely to remain very long unexercised. It has been far too widely recognized for that.

The Upper Thames as a Water Reservoir.

In the course of the inquiries and discussions which have taken place during the past twenty years on the subject of the Metropolitan Water Supply, several plans have been put forward for utilizing to greater advantage the water of the Thames. The volume of the river has been acknowledged to be sufficiently ample to allow of further drafts upon it for the supply of the dwellers upon its banks; and provision is being made, by the scheme of storage reservoirs in its valley which is now being carried out, for taking an additional quantity of water from the stream, and husbanding it for future use. These storehouses—if the term may be allowed—are already so numerous that it has given rise to the saying among oarsmen that one cannot land in certain reaches of the Thames without stepping on to a racecourse or into a reservoir. And the number is not very likely to diminish, as the opinion is generally held that it is by the provision of more of these great receptacles for the water which is actually at our doors that the needs of the future population of London will be supplied. But are they really required? Is it not possible, instead of covering with reservoirs large tracts of land on the banks of the river, to convert the river itself into a reservoir by deepening the channel? According to a letter in last Friday's "Standard," from a correspondent writing from Wallingford, the idea is perfectly feasible. He proposes that some fifty miles of the river bed between Teddington and Oxford should be deepened—three-fifths to the extent of six feet, and the remainder to about three feet. He points out that the deep parts of the river are of no use as a reservoir so long as the existing shallow parts remain. Remove these, and London would, he says, have, in the event of a long drought, some ninety miles of additional four-feet volume of water, while there would be a greater depth for navigation. He thinks such a scheme as this could be carried out for £4000 per mile, or £200,000 in all; and he suggests that the Conservators

of the river, the Water Companies, and the local authorities of the towns along the Thames Valley might combine to undertake the work. No doubt the deepening of the bed of the river would help very materially in preventing those heavy floods which have at times been so destructive; and £200,000 would not be an outrageous sum to spend in preventing the recurrence of such disasters, and at the same time adding to the store of water available for the service of the Metropolis. But is the expenditure necessary? In a few months the river will be sending some of her superfluous water into the great reservoirs at Staines; and before very long, her stream will be drawn upon in order to fill those lately commenced by the Southwark and Vauxhall Water Company at Walton. With the completion of these works, however, finality will not have been reached. They are only instalments of a great scheme. We have not anything to say as to the engineering features of the proposal of our contemporary's correspondent; they would probably not present anything formidable. The point is whether much of the benefit that he claims would accrue from carrying out his project will not be derived from works which are actually in hand, and others which will follow them.

ESSAYS AND REVIEWS.

THE GAS AND WATER TRADES EXHIBITION AT VIENNA.

[Second Article.]

Our first article on this exhibition dealt mainly with the lighting of the rooms and grounds, and the various exhibits of high and low pressure incandescent gas-burners. On the whole, these constituted the most interesting of the topics to which our attention was attracted in the course of a tolerably close scrutiny of the exhibition. But there were a few other matters which appeared deserving of notice in the "Journal," by reason of either their novelty, their general utility, or their historical associations.

Gas-stoves always bulk largely at an exhibition of this nature, and many of the stalls at Vienna were almost entirely devoted to them. Gas-fires were mainly represented by the luminous flame variety, which is associated in all countries with the name of Friedrich Siemens. Whether the regenerative principle, which guided Siemens in the construction of his gas-fires, was embodied in all of the fires which outwardly resembled them, could not be determined without a closer examination than was possible under the circumstances. The Vienna house of the firm of Friedrich Siemens showed some half-dozen of the well-known gas-fires of the firm. Most of these were encased with artistic tiles which gave them some resemblance in outline to the coke-stoves which, in Germany and Austria, take the place of the English open grate. They have the advantage of standing independently in a room, at any spot where a flue-pipe can be led into a chimney or the open, just as the coke-stove is placed in most Continental rooms. But probably they would not at present be appreciated in this country, where nothing which does not ape the appearance of the open grate finds general acceptance. Nevertheless, it should be pointed out, on behalf of any readers who may not be so far linked to traditional prejudices, that these independent tiled gas-fires on the regenerative principle are finished in a highly artistic manner, in a great variety of designs, and are, moreover, generally speaking, extremely economical. Where gas is as dear as it is in most German and Austrian towns, gas-fires which are extravagant of the fuel find no market. The Siemens firm also exhibited water-heaters, suitable for supplying hot water for shower and ordinary baths; all consuming the gas with luminous flames, and thus avoiding the production of the poisonous gaseous products commonly found with the usual geyser type of apparatus. A very high degree of efficiency is claimed for these water-heaters. They are stated to utilize practically 100 per cent. of the heating value of the gas consumed.

Similar gas-fires and water-heaters were shown by several other firms; but in the majority of cases, there appeared to be no essential difference for the better from the Siemens exhibits. Both fires and bath-water heaters were exhibited by Messrs. Schaeffer and Walcker, of Berlin, and Herr W. Ritter, of Vienna. The latter's fires, &c., were chiefly on the designs of Herr Wobbe, the Manager of the Vienna Municipal Gas-Works. They aim at great economy, by the application of the regenerative principle. A special feature is made of a scheme for the conversion of the ordinary Continental coke-stove to a gas-fire, acting on scientific principles. This scheme will appeal to householders who have already installed coke-stoves, which are often highly ornate and expensive articles, and wish to make the change to gaseous firing with as little outlay and disturbance of existing arrangements as need be. Some of Herr Ritter's exhibits bore the trade mark of the well-known firm of Houben-Sohn Carl, of Aix-la-Chapelle.

Many cooking and heating appliances of general utility and good construction from the Dessau workshops of the German Continental Gas Company were exhibited by Herr C. F. Schweickhart, of Vienna. Messrs. L. and C. Hardtmuth, of the same city, showed highly ornate stoves—not all for gas firing; and the Compagnie Parisienne d'Eclairage et de Chauffage par le Gaz, of Paris, showed excellent cooking apparatus and a model kitchen. Messrs. Schultze and Klimsch exhibited a stove which could be readily adapted to burn either coal, coke, or gas. Herr R. Wehle, of Elberfeld, showed regenerative gas-fires; and Messrs. Butzke and Co., of Berlin, had a large display of all types of gas heating and cooking appliances. The above comprise the chief exhibits in these classes of apparatus, though the list of exhibitors of them is by no means exhausted. We do not think, however, that the remainder call for special notice here.

There were a few interesting gas and oil motor exhibits. Messrs. Langen and Wolf, of Vienna, had examples of the "original" Otto gas-engine, of the latest pattern. One of 2-horse power was driven by water gas, and another of 1-horse power supplied the power for operating the "Boule" or "Kugel" high-pressure incandescent burners, described in our first article. Of historical interest was a ¼-horse power gas-engine, built in 1873, according to the design of Messrs. Otto and Langen, which attained considerable popularity, until Mr. Otto brought out his "silent" engine in 1876. In the 1873 type, the actual work was performed by the atmosphere in forcing the piston down after it had been driven up, unrestrained except by its own weight, by the energy of the explosion. Many readers of the "Journal" will recall this type to mind, if only from vivid recollections of its noisiness in action. Needless to say, Messrs. Langen and Wolf's exhibits displayed all those good points which the ripe experience of the Otto firms in different countries has evolved for the improvement of the original pattern. Motors for the consumption of coal gas were also exhibited by the G. Adam's Motor-Works, of Mähren; J. Blaschke, of Vienna; and J. Polke, of Vienna. Air-gas and benzoline engines were exhibited by the Amberg Gas-Engine Works, and the local agents of De Dion Bouton and Co., of Paris. There were a number of diagrams and drawings of gas-engines, and a few smaller exhibits in this class.

Several descriptions of air-gas apparatus were shown in action; and in most cases the air gas was employed for incandescent lighting. Two air-gas generators—the "Sirius," exhibited by Messrs. F. Bothe and Co., of Vienna, and the "Excelsior," shown by the Commanditgesellschaft für Mühlenbau und Beleuchtungswesen, of the same city—appeared to be good examples of this class of apparatus. Another air-gas generator, using gasoline, was shown in action by the Amberg Gas-Engine Works; while the Fischer apparatus, as recently described in the "Journal" (June 18, p. 1672), and intended primarily for the consumption of benzol, was shown by Dr. Paul Palester, of Vienna. The figures given by the different exhibitors do not admit of a ready comparison of the relative efficiencies of the plants; but all claim that the air gas obtained is cheaper than coal gas at Vienna prices—4s. 6d. per 1000 cubic feet—for lighting by means of incandescent burners. The chief aims of the inventors, however, appear to be to compete with acetylene and other illuminating agents in places where a supply of coal gas is not obtainable. It is worth while, from the data given by the inventors, to make a rough comparison of gasoline with benzol as a carburetting agent for air. Both have calorific values of about 4500 calories per pound; that of gasoline being perhaps the higher, and approaching 5000 calories. The Amberg air gas is stated to have a calorific power of nearly 163 calories per cubic foot; hence 1 lb. of gasoline would yield about 30 cubic feet of the air gas. The Fischer gas is stated to have more than double the calorific power of coal gas—say, about 310 calories per cubic foot; hence 1 lb. of benzol would yield about 14½ cubic feet of Fischer gas.

Now benzol is assumed to cost 1·1d. per pound—*i.e.*, about 9½d. per gallon—and a light of 121-candle power (138 Hefner units) is stated to be obtainable by means of Fischer gas at a cost of 0·08d. per hour, and hence by the consumption of about 1 cubic foot of the gas, or 0·07 lb. of benzol. Therefore, 1000 candle-hours would be obtained by the consumption of rather less than 0·6 lb. of benzol. Now gasoline of ·65 specific gravity costs in Germany about 1s. 4d. per gallon—or, say, 2½d. per pound. The Amberg firm state that the air gas they make gives a light of 50 German standard candles (not Hefner units)—that is to say, about 52½ English candles—at a cost of about 0·14d. per hour. Hence the 52½ candle-hours are obtained from about 0·06 lb. of gasoline, or 1000 candle-hours from about 1·1 lbs. of gasoline. Therefore, it would appear that more than half as much again gasoline as benzol is required to give the same illumination by the incandescent system. Of course, it is well known, as was clearly established in a series of articles on "The Enrichment of Coal Gas" in the "Journal" for September and October, 1897, that benzol is superior to gasoline in enriching value in an even higher ratio when applied to coal gas which is tested by consumption in the standard London argand burner; but it has not, we think, been shown hitherto that this superiority obtains also in incandescent lighting. Some portion of the difference in the amount of benzol and gasoline consumed per 1000 candle-hours obtained may be ascribed to the fact that the light had in one case an intensity of 121 candles, and in the other of only 52½ candles. The calorific power of the two combustibles is much the same; and

hence we must look to differences of flame temperature to account for the higher efficiency of the benzol air gas in incandescent lighting. Probably the temperature of the benzol flame is some 700° Fahr. higher than that of the gasoline flame. But it would be improper to attempt any further generalization in this direction from the data available in the pamphlets of the Amberg and Fischer concerns. Otherwise we might incautiously be led to make a deduction, which would subsequently be disproved, that coal gas enriched with benzol ought to be very superior to coal gas unenriched, or enriched by other agents, for incandescent lighting. The question is, however, one well worthy of attention.

With regard to the working of the air-gas plants, we were satisfied that the Fischer apparatus was very simple and compact, and apparently highly efficient. The Amberg plant also appeared to work in a very satisfactory manner. The Fischer apparatus is adapted to use gasoline in place of benzol; but we did not learn what duty was obtainable from it under these conditions.

It is an easy transition from air gas to acetylene, since both cater for the same section of the community—viz., dwellers in places where a public supply of coal gas is not available. Acetylene generating plant was exhibited by Messrs. Bauer and Co., of Gratz, Herr Klinger, of Vienna, and Messrs. Ambros Rohracher and André Totschnig, of Lienz; but none of the exhibits calls for special mention. Burners suitable for the smokeless consumption of acetylene were shown by, or on behalf of, well-known makers of steatite gas-burners, Herr J. von Schwarz and Messrs. Stadelmann and Co., both of Nuremberg. Incandescent acetylene burners were exhibited by at least three firms—viz., Messrs. F. Krückl and Co., of Vienna, the "Eminent-Fahrradsattel," of Berlin, and Herr W. Güntner, of Vienna. The last-named gives the duty obtainable with his burner as a consumption of 8·83 cubic feet of acetylene per 1000 "candle" hours. Probably "candle" here means Hefner-unit; and hence the consumption of gas per 1000 English candle-hours would be about 10 cubic feet, or 1 cubic foot of acetylene consumed in an incandescent burner gives about 100 candle hours. This is only about four times the illuminating duty obtainable from coal gas in a good incandescent burner; hence acetylene must certainly not cost *at the burner* more than four times as much as coal gas, if it is to compete with it for lighting by incandescence. For lighting by means of flat-flame burners, on the other hand, acetylene is about on equal terms with coal gas when it costs ten times as much, volume for volume. This comparison illustrates the effect the incandescent system of lighting has had in equalizing the illuminating values of so-called rich and poor gases. So that, in this extreme case, the richest illuminating gas known—acetylene—gives, at the most, four times the lighting duty of the relatively feeble illuminating coal gas, or even of so-called non-illuminating "blue" water gas.

Water gas was represented at the exhibition by a small plant on Dr. Strache's system, and a fine exhibit of burners for lighting and heating by means of water gas by the firm of Kurz, Rietschel, and Henneberg, of Vienna, by whom the Strache plant had been constructed. This plant, which was shown by the International Water Gas Company, of Vienna, had a productive capacity of about 350 cubic feet per hour. The fuel used was coke, broken to about the size of walnuts. The plant, though on a diminutive scale, as was inevitable with the limited sphere of application within the exhibition for gas made by it, was complete in all respects, and easily manipulated. It was not provided with a regenerator, as Dr. Strache only applies the regenerative principle in plant intended for the consumption of coal instead of coke, and even then only with generators of fairly large capacity. As we hope shortly to give an exhaustive description of the different types of Strache water-gas plant, as now made, we will not say more about the small plant at the Vienna Exhibition, except that the only part of it which seemed to be in any sense unpractical was the mercury-sealed reversing valve. This worked well on the small plant, with connections about 3 inches in diameter; but it appeared that when the connections were (say) 12 inches in diameter, as would be required in any large plant, the effort of lifting a ∩-piece out of one seal and dropping it into another, would be too great for the operator. Possibly, however, Dr. Strache has some other means of meeting this difficulty in large plants.

The lighting by means of the simple uncarburetted water gas was with burners outwardly somewhat resembling the "C" Welsbach burner, but, of course, without the internal air supply which is required to consume coal gas with a non-luminous flame. According to Dr. Strache, with these burners 1000 English candle-hours are obtained from 52 cubic feet of water gas, which is a duty of about 20 candles per cubic foot. The lights certainly had a very pleasing effect, and compared favourably even with the best examples of incandescent burners using coal gas.

There were a few interesting exhibits of street-lamps, &c.—practically all intended for incandescent lighting. The works known as G. Himmel's, of Tubingen, had some good specimens of lofty standards, with lighting devices manipulated from the base. An ingenious method for lighting street-lamps fitted with incandescent burners of the Kern type, by means of the ordinary lamplighter's torch, was Niermeyer's. There was the usual hinged flap at the base of the lantern, through which the torch was pushed; but immediately above the opened flap was the mouth of a woven-wire casing, of the shape of a sugar loaf. The narrow upper end of the casing was near the mouth of the burner; so that, when the torch entered the casing, the latter was filled with flame, which at the upper end passed through the mesh and ignited the gas issuing from the burner. Thus the burner was lighted as rapidly as an ordinary flat-flame burner by means of a simple torch; while there was no possibility of the torch coming in contact with the mantle. The only objection which might be raised to this arrangement was the presence in the lantern of the wire casing, placed vertically alongside the stalk of the burner. It might be argued that the casing would cast a slight shadow on one side of the lamp over a small area a few feet from the lamp-post. But this objection is, in reality, imaginary rather than real.

Gas fittings in great variety were displayed on seven or more stands; and there were some good exhibits of tools and fitter's appliances. Especially noticeable were some of the iron and steel tubes and fittings shown by the Witkowitz works, Fischer's works, and the Hungarian State Iron Works. These would have done credit to any country. There were also some cylinders for compressed gases (which had been fractured under high test pressures), exhibited on behalf of the Mannesmann firm, so as to show the superiority of the Mannesmann system of tube drawing for producing cylinders of high tensile strength.

With regard to plant for use on gas-works, there was a good model of the well-known coal transporting and elevating apparatus of Messrs. C. W. Hunt and Co., of New York, exhibited by their Agents, Messrs. J. Pohlig, who have already installed it at the Mayence Gas-Works (among others). Otherwise there was little of direct interest to the gas-works engineer in the exhibition. Among the exhibits at the Musical Association's Rooms during the continuance of the meeting of gas engineers, was, however, a model of a washer-scrubber, resembling the "Standard" in general construction, but differing from it in the nature of the filling or packing. In the one in question, which is made by Zschocke's Engineering Works, of Kaiserslautern, each compartment is packed with loose beech-wood balls, about the size of the fist. These balls rub against one another during the rotation of the washer, and thus cleanse themselves; so that the obstructions which sometimes occur, from the presence of tar or the use of hard water, in other types of washer-scrubbers are avoided. Dr. Pfeiffer has given a favourable report of the working of one of Zschocke's ball-washers at the Lüneberg Gas-Works.

Analytical and photometrical apparatus was scantily represented. Dr. Strache and Dr. Jahoda showed the new apparatus for the analysis of gas which was described by Dr. Strache in his paper read before the meeting of gas engineers at Vienna. As already stated, we hope to give particulars of this useful apparatus shortly. Lux's Manufacturing Company, of Ludwigshafen-on-the-Rhine, showed the well-known Lux's gas-balance. Dr. Anton Kauer exhibited his milk-glass photometer, which has recently been described in some of the German technical papers. Of this, also, it is impossible to give a brief description; and we hope to publish a full account in a short time.

Messrs. Schinzel and Schneider, of Vienna, showed a number of well-finished gas-meters; and at the Musical Association Rooms, we noticed a good exhibit by the well-known German firm of Messrs. Elster, of prepayment and other meters, some with glass casings to show the chief working parts.

A number of interesting exhibits illustrative of the history of gas lighting had been collected and lent by Herr F. Walter, of Vienna. The collection was specially complete in respect of incandescent burners, from the Fahnehjelm comb onwards. Welsbach burners from 1885 were shown, including the English type of mantle of 1887. There were sketches also of gas-works plant erected in Paris and Vienna in 1818, and in Berlin in 1826. Altogether this collection was well worthy of exhaustive study. The history of gas lighting could also be studied from literature lent by Heer P. Bolsius, the Manager of the gas-works at s'Hertogenbosch, and Editor of "Het Gas." One of the most interesting books in this collection was one published at Vienna in 1817—"A Guide to Lighting with Coal Gas," by Professor J. Prechtl. There were many other works of a slightly later date, as well as quite modern ones, including a handsomely bound volume of "Het Gas" for the past year. Heer Bolsius provided the most interesting contribution to the literature exhibited, though many of our Continental technical contemporaries had space allotted to them. Of English papers, the "Ironmonger" alone was shown, with the exception of the numbers of the "JOURNAL" containing Herr Herrmann's description of the new gas-works at Vienna.

We have endeavoured in this and earlier articles to give a succinct account of the more important features of the exhibition which has just closed. For obvious reasons we have not referred to all the exhibits, but have aimed at giving a general idea of the scope of the undertaking. We have already indicated that we were disappointed to find gas-works plant quite inadequately represented. Moreover, there were really very few novelties of any importance. Nevertheless, we believe the exhibition must be regarded as distinctly successful. It was located in a prominent position, amid beautiful surroundings, and undoubtedly attracted a large number of the general public, thanks in some measure to the efforts of the Grand Duke Leopold Salvator, and the engagement of a good military band. Gas engineers who visited the exhibition seemed most interested in the high-pressure systems of incandescent lighting, and in Dr. Strache's water-gas plant and burners. But they all appeared to be looking forward to seeing some far better exhibits of gas plant and apparatus at next year's general industrial exhibition at Düsseldorf, for which the preparations are, we understand, already far advanced.

GAS FOR LIGHTHOUSES.

A VOLUME has recently been published which is intended to set before the public the career of an eminent engineer whose achievements were mainly concerned with lighthouses.* The biography makes interesting reading, and gives details of Sir James Douglass's private life as well as of his official career. After graphically describing the work of his hero in connection with the construction of such lighthouses as the "Smalls," the new "Eddystone," and others, Mr. Williams proceeds briefly to refer to the all-important question of lighthouse illuminants. But, unfortunately, he touches the subject so lightly that his readers will be unlikely to grasp its great importance. And yet Mr. Williams well knows that the most important part of a lighthouse is its light, and that, while solid foundations and a substantial superstructure cannot be done without, they are necessarily of small value if the lights which they carry are not sufficient for the proper guidance of the mariner. He refers in Chapter XVI. to a Committee appointed to investigate the respective merits of gas, oil, and electricity as lighthouse illuminants; and he mentions that the name of the illustrious physicist, the late Professor Tyndall, "who had for many years rendered such conspicuous service in his capacity as scientific adviser to the lighthouse authorities of this country, does not appear in the list of eminent men who technically assisted in this investigation." "Unfortunately," he adds, "the Professor resigned all connection with lighthouse matters in the initial stages of the arrangements for conducting this very inquiry."

With a brief word of commendation of the Professor's motives, and an implied condemnation of his views, Mr. Williams passes over Professor Tyndall's resignation. Can he have forgotten the thrill of interest that it caused in the maritime world? We ourselves have always regarded it as a most interesting and instructive episode. We have before us the Parliamentary Papers containing the detailed account of the circumstances under which that resignation took place. The Board of Trade, acting through its President (at that time Mr. Joseph Chamberlain), nominated a Committee to investigate the question of the best illuminant for lighthouses, and appointed Professor Tyndall as Chairman. The papers reveal many shiftings and changes in the *personnel*, and indeed in the objects, of the Committee. Sir James Douglass insisted on certain conditions, which led to a voluminous correspondence, and ended in the regretable resignation of Professor Tyndall. His resignation could have been no light matter. He suffered considerable pecuniary loss thereby, and the post of Scientific Adviser to the Board of Trade and to the other Lighthouse Boards which he felt compelled to resign was one which he had held with distinction for many years. By the light of these papers, we agree with Mr. Williams that the Professor's action in resigning his position (and its emoluments) rather than be a party to any arrangements that had not the stamp of impartiality was, in the highest degree, "chivalrous," and that his motives were "disinterested." But we do not agree with Mr. Williams's dictum, that the "time has passed" for the expression of opinion as to the "correctness" of the Professor's views respecting the proposed investigation. We hold, on the contrary, that it is not too late to justify, by means of the evidence before us, the views of any of the men who took a prominent part in the inquiry. Having, then, pursued this process with regard to Professor Tyndall's course of action, we are driven to the conclusion that his views were "right and proper," and that the proposed arrangements, to which he refused to accede, could not have commended themselves to any honourable man.

As specialists in the matter of artificial illuminants, we have a peculiar interest in the experiments carried out at the South Foreland, to which Mr. Williams refers; and we imagine that they are also likely to interest persons who are not experts. Indeed, no one can be indifferent to the work done by lighthouses in the protection of property and lives. Mr. Williams leaves his readers to infer that gas as a lighthouse illuminant was beaten in the trials. The facts, however, in no way warrant such a conclusion; and therefore we think it right to call attention to them, and to the precise position in which the matter now stands.

In 1865, gas had been introduced as a lighthouse illuminant at Howth Bailey Lighthouse, near Dublin, by the Commissioners of Irish Lights, to whose notice the system had been brought by its inventor, Mr. John R. Wigham, of Dublin. The gas-burners under Mr. Wigham's system are composed of steatite fish-tail jets in various sizes. Each steatite jet is fixed in an iron case; and all are grouped together so as to form a compact united flame. The excess of carbon found in the upper part of the flame of every fish-tail jet is turned to account, and made a means of increasing the illuminating power of the burner. The oxygen of the air is brought into close contact with the top part of the flame, so as to render it not only smokeless but much more brilliant than is the case when the jets are burned separately. These united flames give about 8 to 10 candle power for each cubic foot of gas consumed. This method of compacting and intensifying the flame is accomplished not by a surrounding chimney glass, as in the case of the argand burners, but by a conical air-shaft at the bottom of the burner, and an overhanging cylindrical pipe, which does not interpose any obstructing medium between the light itself and the lenticular apparatus.

The ordinary clear-weather burner consists of a group of 28 of these jets; and it is sufficiently powerful to show well to the horizon in such weather. By a perfectly novel and unique arrangement of mercurial joints, the lightkeeper can, as the weather thickens, increase the power of the burner so as to cause its light to penetrate fog and haze to an extent previously unknown in lighthouse illumination. The steps of this increase in power are from the initial power of 428 candles (approximately) to 800, 1200, 2400, and 3000 candles respectively; and the 3000-candle power can be still further increased, by what is termed the quadriform arrangement, to 12,000 candles, and, by the double quadriform, to 24,000 candles. These illuminating powers are from the burners alone, without assistance from the lenticular apparatus employed in the lighthouse.

The Commissioners of Irish Lights found in actual practice that great benefits to navigation arose from the adoption of this gas system, and that the gas-light was much more powerful and efficacious for lighthouse purposes than the oil-light then in use. Seamen noted the power of the light to penetrate haze, and that even when the light itself was utterly extinguished by fog, the luminous glow surrounding the largest burners rendered the position of the lighthouse unmistakable. Testimony to the excellence of the light was forthcoming from the captains of the Holyhead steamers and others. An oil-lamp of four wicks was the most powerful oil-light used up to that time in lighthouses. Its illuminating power was 328 candles; while the power of the gas which replaced it was 2934 candles. Professor Tyndall, in his capacity of Scientific Adviser to the Lighthouse Boards and the Board of Trade, visited Ireland on several occasions, and carefully examined the effect of the gas-light as applied to the various forms of lighthouse lights—making many photometric experiments, and observing the light from sea at various distances, and in various states of the weather. He confirmed the Commissioners of Irish Lights in their opinion, and encouraged them to extend the system, and use gas for intermittent, flashing, and revolving lights as well as for fixed lights. He showed that gas possessed a "flexibility" of application which renders it capable of producing lighthouse lights of almost endless variation of form, and that while gas could be cut off to cause intermissions and distinctions in a manner and with an economy not possible with any other light, it could also, unlike any other light, be employed, much to the benefit of the sailor in different degrees of power to suit the varying conditions of the atmosphere. Thus encouraged, the Commissioners of Irish Lights proceeded, notwithstanding the adverse opinion expressed by Mr. Douglass to develop their gas system, and applied gas to other of their principal lighthouses. In this, they had the full concurrence of the Board of Trade. There are at the present time eleven lighthouses in Ireland in which gas is the illuminant.

Shortly after the first introduction of gas as a lighthouse illuminant in Ireland, it was found desirable to fix a singal light on the Clock Tower of the Houses of Parliament. Before deciding on the illuminant, trials were ordered to be made between the electric light and one of Wigham's lighthouse burners, and Mr. Douglass was requested by the Board of Works to make these trials. He reported against gas, and in favour of the electric light. Parliamentary Papers show how great was his hostility to gas-light even at that early stage. But, though he thus reported against gas, the evidence of the trial was strongly in its favour—showing that it could be seen in fog which completely eclipsed the electric light. The Board accordingly overruled his opinion, and adopted the Wigham gas-light as the permanent signal of the House of Commons, where it continues to do duty to the present day.

Seeing that the gas system was being so extended in Ireland, the Trinity House ordered that an English lighthouse—Haisbro, Norfolk—should be lighted with gas. It was further decided that an exhaustive set of experiments should be made at that station to test the respective merits of gas and oil as lighthouse illuminants. In 1874, the Board of Trade appointed Professor Tyndall (with whom was associated Professor Valentin, of the Science and Art Department, South Kensington, as his assistant) to make the investigation for the information and guidance of the Trinity House. The experiments were most carefully conducted. Mr. Douglass and Mr. Wigham were present, and testified their complete satisfaction with all that was done, signing the papers submitted to them by Professor Valentin.

Briefly stated, the experiments showed that gas was vastly better than oil; the highest illuminating power of the latter (attained with a newly brought out 6-inch lamp) being 722 candles, while the highest power of a single gas-burner was 2934 candles. These photometric results were confirmed by the observations of the Elder Brethren of the Trinity House, who, accompanied by Professor Tyndall, went out to sea to judge the lights by practical trial. Parliamentary Papers on these experiments show that they were intended to be final. But Mr. Douglass afterwards issued a paper in which he attempted to prove that the greater power of the gas-light was not available for lighthouse purposes. Professor Tyndall, in reply, showed the fallacy of his remarks, and strongly protested against the demands made upon his time by imaginary and unfounded objections, and attempts to substitute theories for facts.

In 1878, the Irish Lights Commissioners adopted the multiform system of gas-light invented by Mr. Wigham, and applied it (in quadriform) at the Galley Head lighthouse, on the coast of Cork,

* "The Life of Sir James Nicholas Douglass, F.R.S., formerly Engineer-in-Chief to the Trinity House." By Thomas Williams. London: Longmans, Green, and Co.

On this occasion also, the Trinity House engineer condemned the gas-light, and wrote a hostile report. His opinion was in direct opposition to that of Professor Tyndall, who, at the request of the Commissioners of Irish Lights, examined the light. He made a series of careful experiments, which proved incontestably the superiority of the gas-light. He was also able to put forward unanimous and valuable testimony to the excellence of the light, from Sir William Thompson, Mr. Gray, the Marine Secretary to the Board of Trade, as well as from "all sorts and conditions of seamen, from the commanders of the great Atlantic companies down to the more humble but not less experienced pilots of the adjacent port of Cork."* It should be remembered that the available fog power—12,000 candles—of the Galley Head gas-burner had been hitherto approached by no lighthouse beacon in the world. The evidence of the sailors and pilots is printed in the Parliamentary Papers.

Soon after this the Commissioners of Irish Lights determined to place on Mew Island, at the entrance of Belfast Lough, a gas-light on the same principle as that of Galley Head, but of still greater power. They again met with strong opposition from the same quarter as before; but, in the interests of the sailor, they refused to recede from their position, and the light was established. The testimony of seamen as to its great power and distinctiveness was even more striking than that in the case of Galley Head. The Commissioners next proposed to fix on Tory Island, on the north-west coast of Ireland, a gas-light similar in principle to, but considerably superior in power than, that of Mew Island. Opposition was again raised, but with the sanction of the Board of Trade and of its President, Mr. Joseph Chamberlain, who personally made careful examination of the lights, the proposition was acceded to, and the new light—the greatest lighthouse light in the world—was fixed on Tory Island.

In consequence of the continued opposition to the development and extension of the gas system desired by the Commissioners of Irish Lights, Mr. Chamberlain in the autumn of 1881 again intervened, and determined that a fresh and exhaustive examination of the relative powers of the respective illuminants should be made at Howth Bailey, under the superintendence of Professor Tyndall. It was proposed that Sir James Douglass should be on the Committee; but Professor Tyndall was of opinion that if he, being the advocate of oil and the patentee of oil-burners, were placed on the Committee, Mr. Wigham, the patentee of the gas system, should also be one of its members. This proposal gave rise to much correspondence, and elicited the strong opposition of the Trinity House. Subsequently the constitution of the Committee was altered; and the *venue* of the proposed experiments was changed to the South Foreland. Captain Nisbet, one of the Elder Brethren of the Trinity House, was appointed Chairman instead of Professor Tyndall, and other gentlemen, chiefly connected with the Trinity House, were placed upon the Committee. Professor Tyndall, believing that a Committee thus constituted could not give fair play to the gas system refused to join it. He strove long and strenuously to bring about a more equitable arrangement; but his efforts proving unsuccessful, he resigned his office on March 23, 1883. Professor Tyndall's action in thus resigning a position of honour and responsibility, rather than countenance what he considered to be wrong, presents an instance of high-principled self-denial of which we have too few examples among our public men.

The Committee, thus deprived of the assistance of Professor Tyndall, held some meetings, and in their deliberations as to the experiments to be made, their nature and extent, Sir Robert Ball, F.R.S., representing the Commissioners of Irish Lights, proposed a course which to our mind was not only fair but absolutely necessary. He declared that, in the experiments, each system of illumination should be fully and fairly tried in the most powerful form in which it was possible for it to be shown; and that therefore the most powerful of the Wigham gas-lights—namely, the "double quadriform"—should be used as the exponent of gas. The majority of the Committee would not agree to this most reasonable proposition; and the Irish Lights Commissioners, deeming it unfair that gas should not be allowed to be used at its best, and holding that the inquiry would as a consequence be valueless,—withdrew their representative. Thereupon Mr. Chamberlain dissolved the Committee; and shortly afterwards, at the request of the Trinity House, he gave the inquiry into their sole charge. They, on their part, handed the whole matter over to their Engineer, Sir James Douglass, who arranged and carried out the experiments as he thought best.

The rivalry between the electric light and gas light for lighthouses had already attracted much public attention. Scientific men and experienced seamen had pointed out again and again that the electric light had a dazzling and misleading effect in clear weather, and was absolutely useless in foggy weather. But the friends of the electric light could not see its defects, or would not admit them; and the experiments at the South Foreland came to be regarded in nautical circles as virtually a contest between the electric light and gas light, since at small lighthouses, and at rock stations, where there is no room for either gas or electric apparatus, oil must necessarily be the illuminant. The experiments excited a considerable amount of public notice both in this and other countries; but the amount of interest evinced would certainly have been less had it been generally known that the experiments would be carried out, and the report issued, by the champion of one of the contesting illuminants, who, although the avowed opponent of the other, was the judge appointed to issue the final award.

The experiments occupied more than a twelvemonth. They were elaborate in their details, and involved a cost of some £10,000. At their conclusion, a voluminous report was issued by the Trinity House; but, as stated by themselves, the arrangement of the experiments, as well as the report concerning them, was the work of their Engineer, Sir James Douglass. The details of the report are full of interest. Without burdening our readers with particulars, we may say that, in its general conclusions, gas is practically ignored, and the electric light is stated to be the best illuminant for important headlands and landfalls. We confess ourselves unable to see how this conclusion can be drawn from the particulars given in the details of the experiments set forth in the report itself. Scientific men and others were of the same way of thinking; for when the report first appeared, the Parliamentary Papers show that there was wide-spread feeling of doubt and incredulity in the public mind respecting its conclusions. Attention was called to the illusory and unsatisfactory nature of the report; and shipowners, underwriters, and others interested in the question of the best means of insuring safety of life and of property at sea, memorialized the Board of Trade and the Prime Minister on the subject. They pointed out that serious exception had been taken to the findings of the report, and asked that it should be remitted to scientific experts for revision, and that if necessary further experiments should be made, or that a Royal Commission should be appointed to investigate the subject. The pressure thus brought to bear upon the Government came from the most important sea-ports in the Kingdom, and showed how deeply the maritime community were moved by the statements in the report respecting the electric light—statements that were at variance with the practical experience of seamen as to its unsuitability for lighthouse purposes. The Board of Trade in consequence submitted the report to three experts—Sir George Stokes, Lord Kelvin, and Lord Rayleigh—instructing them to say whether its final conclusions were borne out by the evidence of the report itself. The papers do not show that this Committee carried out these precise instructions; but they wrote a lengthy report on the subject to the Board of Trade.

In an exhaustive *résumé* of the case, printed in full in the Parliamentary Papers, Mr. Wigham pointed out that in many important particulars the conclusions of the report were not warranted by the facts contained therein. He winds up thus: "It will be seen from the foregoing statements of facts that, in the experiments at the South Foreland, the gas-system was not given fair play; its most powerful form of light the (double quadriform) having been refused a trial, its peculiar adaptability for flashing, and its superiority for fixed lights, admitted in the report, are minimized or not taken into account; that the oil system was not fairly tested, not having been tried under circumstances similar to those fixed in lighthouses; that the electric light was not fairly tested, its beam having been so applied as to give it an undue advantage over the other lights, being directed to the observers, instead of being shown over the sea as lighthouse lights are shown; that the tables of costs in the report are erroneous and misleading; and that, therefore, for these and other reasons the conclusions of the Trinity House report are not such as can be justified by the record in the report itself."

The three eminent experts above mentioned, so far from ignoring gas, as was done in the conclusion of the Trinity House, spoke highly in their report of its many advantages for lighthouse purposes. They say: "We are not surprised that the splendid lights which have been erected at some points of the Irish Coasts, on the system which has been so ably worked out by Mr. Wigham, should have created a strong feeling on the part of the shipowners in favour of gas. . . . Gas naturally lends itself more conveniently to intermittence than oil; since with gas, a perfectly sharp transition from light to dark, or the converse, is effected by turning off or turning on the gas. . . . Gas yields itself, with special facility, to the conferring on a fixed light of a distinctive character by means of intermittence, and that by an actualsaving of the illuminant. . . . Gas possesses undoubted advantage over oil in some respects—such as facility of increasing the power on the sudden occurrence of fog, absence of the necessity of trimming, power of making instantaneous transition from light to dark, and conversely."

Reading between the lines, this document shows that the conclusions of the report of the South Foreland experiments are unreliable. Indeed subsequent action by the lighthouse authorities completely disproves the statement that the electric light is the best for salient headlands and important landfalls; for since the date of the report not a single lighthouse has been lighted by the electric light, while gas has been supplied in at least two important new lighthouses. The claimed superiority of the electric light for lighthouse purposes has not only been thus rendered questionable by the practice of the lighthouse authorities themselves, but its inadequacy has been so fully set forth by the constant flow of evidence against the light from sailors and others, and by the sad account of shipwrecks of which it has been the cause, that the authoritative statement made by the President of the Board of Trade, in answer to recent questions in the House of Commons, seemed hardly necessary to give the *coup de grâce* to that illuminant for lighthouses, and to show the fallacy of the conclusions of the report prepared by Sir James Douglass.

* "Fortnightly Review," Dec., 1888, p. 820.

PRODUCTION OF LIGHTING GAS FROM SMOKE.

It is an acknowledged fact that complete combustion of fuel is scarcely possible with the grates at present employed in dwelling-houses and factories; and consequently a large proportion of it is lost by passing up the chimney in the form of soot. This soot contains unconsumed carbon—to the extent sometimes of 25 to 30 per cent. of the weight of the fuel—carbonic oxide, hydrogen, heavy hydrocarbons (tar, &c.), and an amount of carbonic acid which varies with the degree of perfect combustion. To be chemically complete, combustion should only produce carbonic acid, aqueous vapour, and the inevitable nitrogen—leaving a small quantity of ash as residue. Practically, as already remarked, this result is never attained—in fact, many circumstances have an influence on the manner in which combustion takes place. One of these is the excessive amount of air entering the fireplace at the surrounding temperature. It is generally found that combustion under perfect conditions—viz., with the minimum quantity of air in the grate—produces from 15 to 20 per cent. of carbonic acid with a loss of 10 per cent. of fuel in the form of smoke; whereas two or three times more than the theoretical minimum would only give 6 to 7 per cent., with 25 to 30 per cent. loss of fuel. The greater the excess of air, the worse are the results; and with nine or ten times more than the minimum quantity of air (a proportion which often occurs in practice), the amount of carbonic acid in the smoke is as little as from 2 to 3 per cent., whereas the loss of fuel is 80 and even 90 per cent. It may be estimated that in an ordinary factory fire there is an average loss of 50 per cent., while in a domestic fire it is 75 and even 90 per cent. All this fuel value lost is found in the form of smoke, combustible gases, &c., and heat represented by the temperature of the smoke (250° to 300° C.).

For about a quarter-of-a-century, M. Tobiansky d'Altoff has studied the smoke question; and, after laborious investigations and numerous experiments, he has succeeded in devising a process by the aid of which he claims that not only is it possible to completely prevent the issue of smoke, but also to utilize all its constituents in the manufacture of a rich gas suitable for lighting, heating, and motive power. Combustion of this gas, it is stated, produces only carbonic acid and aqueous vapour; so that the problem of the complete combustion of fuel and the prevention of smoke would appear to have been economically solved. Smoke from a fire burning any kind of fuel can, it is claimed, be treated by this means without necessitating any alteration in the grate. A description of the process was given in a recent number of "L'Industrie," from which the following particulars have been obtained.

The smoke, instead of escaping into the open air by the chimney, is drawn by a pump, fan, exhauster, or other similar machine, through a tank containing filtering materials, such as pebbles, pumice-stone, wood fibre, peat, cotton, broken coke—in short, any porous substance capable of retaining the solids which are in suspension. Above this tank there is another containing a liquid hydrocarbon (petroleum, benzine, naphtha, benzol, gazoline, alcohol, &c.), which flows in regulated quantity into the lower tank, and saturates the filtering material. The tank therefore acts both as a filter and a carburettor; the purified smoke being carburetted by some well-known process for carburetting air, steam, &c. The resulting product is called "Pyrogas."

When the smoke enters the filter directly from the fire, its constituents may be classed in four categories: (1) Soot, (2) oils or heavy hydrocarbons, (3) unburnt combustible gases, and (4) incombustible gases; and there is also its calorific power. As a consequence of the smoke passing through the filter, the soot is deposited, the heavy hydrocarbons are condensed, and the unburnt combustible gases (carbonic oxide and hydrogen), as well as the non-combustible gases (carbonic acid and nitrogen), pass through, and become saturated with the non-volatilized hydrocarbons in the filtering material. While some of the liquid hydrocarbons are volatilized, others sink to the lower layers of the material, and, owing to the high temperature of the smoke, dissolve and volatilize, and mingle with a large proportion of the oils or heavy hydrocarbons deposited. To regenerate the soot and non-volatilized hydrocarbons left in the filter, the inventor employs as the filtering material combustible substances such as wood fibre, peat, coke, &c. After some time, the material becomes obstructed with soot and tar, and will not allow the free passage of the smoke. It must then be removed from the filter (and it will be found to be excellent fuel, rich in pure carbon and heavy oils), and fresh material substituted. The inventor claims that he recovers and utilizes all the constituents of the smoke—everything being converted into heat.

The gas produced by smoke treated in the manner described consists of various hydrocarbon gases, especially ethylene, carbonic oxide, hydrogen, oxygen, carbonic acid, and nitrogen. Its inventor claims that it is superior to coal gas as an illuminant, owing to the large proportion of ethylene it contains; while it is also more valuable than that gas for motive power and heating purposes. The flame is stated to be white and very brilliant, and not to alter colours. With regard to price, this varies with the composition of the smoke. When the latter is very rich in combustible gases, the "Pyrogas" absorbs relatively few of the hydrocarbons from the filter. Experience shows that smoke containing about 8 to 10 per cent. of carbonic acid absorbs from 60 to 100 grammes (926 to 1543 grains) of hydrocarbons per cubic metre (35·3 cubic feet). If this hydrocarbon costs 25c. to 35c. per litre (1·76 pints), the gas comes to 3 c. to 4 c. per cubic metre. However, the care with which the carburetting process is conducted materially affects the cost price.

The next point to consider is the utilization of the gas. The inventor, as already mentioned, claims that it can be directly employed for lighting, heating, and motive power. It is stated that plant, on a commercial scale which has been in use for some time, has given excellent results from the points of view of economy, efficiency, and healthfulness. Road sweepings, dirt, and other refuse may be employed to produce the gas. It is suggested that the smoke from a number of private houses or factories, or even from an entire town, could be conveyed to central works, and be utilized for the production of "Pyrogas," which in its turn could be employed to generate electricity for power and light. The gas is entirely consumed, leaving no residual product but carbonic acid and aqueous vapour. Though the gas is as dear as, or even dearer than, coal gas, the inventor thinks it would be worth the extra money, considering the fact that it entirely prevents smoke, the presence of which in the air is recognized as being detrimental to health and cleanliness.

COAL-CUTTING BY MACHINERY.

The importance of cheap coal, not only to the gas industry but to every industrial undertaking in the kingdom, cannot be exaggerated, and needs no demonstration, particularly at a time when the effects of dear coal upon trade have been so recently observed at first-hand by our readers. Users of coal have, therefore, a very direct interest in every step taken, or proposed to be taken, towards the cheapening of the means of its production; and we are glad to be able to call attention to the praiseworthy efforts of one of the principal organs of the coal trade to induce the collieries of this country to adopt more generally labour-saving appliances. In this respect, we are lamentably behind our great and growing rivals the United States. Out of a total production in 1899 of 230,254,076 metric tons of coal in the States, no less than 43,963,933 tons, or 23 per cent., were mined by machinery—a quantity largely exceeding the total output of Belgium, France, or Austria. No official return is made of the quantity so cut in this country; but Mr. Gerrard, in his Presidential Address to the Midland Institute of Mining and Mechanical Engineers last December, stated that the total amount of coal cut by machinery in the British Islands in 1899 was only 3½ million tons, or little more than 1½ per cent. of the output.

It was by means of these machines that the United States were able to increase their output in one year by 30 million tons—namely, from 200 millions in 1898 to 230 millions in 1899, when for the first time their total production exceeded ours. Had we been able to increase our output as rapidly as they during 1899 (when it only rose 18 millions, from 202 to 220), the troubles that began at the end of that year would have been averted, to the benefit of all trades, not excluding that of coal-mining, which will not in the long run profit by the exorbitant rates of 1900-1901 so much as it would from a series of years of regular and reasonable prices.

That coal-cutting by machinery is a far more economical process than hewing by hand, is shown by figures quoted in Part IV. of the Home Office Report for 1899, in which it is stated that the average price paid for hand mining in the State of Illinois was 1s. 11½d. per ton, as compared with a cost of 1s. 3½d. for machine mining. Now a saving of 8d. per ton on our output for 1900 represents a sum of £7,500,000; and probably in this country the saving per ton would be greater than in the States. As, moreover, coal-cutting machines do not go on strike, the saving effected annually by the reduction of labour disputes would represent a further considerable sum. Obviously the American collieries find machine mining pays; for the quantity of coal so "won" in the States is increasing far more rapidly than the total output; the figures given by Mr. Parker, the Statistician of the United States Geological Survey being 22·65 millions in 1897, 32·41 millions in 1898, 43·96 millions in 1899—an increase of nearly 100 per cent. in two years. "The path of progress in coal-cutting is, therefore," remarks Mr. Le Neve Foster, "clearly pointed out to us by our American cousins."

Recognizing this fact, the "Colliery Guardian" has published during the past half year a series of very able and exhaustive articles upon the subject, describing the various types of coal-cutting machine in use and explaining the methods of working and the difficulties to be overcome, with the object of arousing colliery managers and owners to a sense of the necessities and possibilities of the situation. From the remarks with which the articles are concluded, it is obvious that our contemporary is no sceptic as regards the danger of American coal at some future time competing with British in markets where the latter is now supreme. The writer says:—

> In conclusion, it appears that the points to be insisted upon are that the whole of the coal of the United Kingdom *must* be cut by machines, or the coal industry of this country will find itself in much the same condition as the corn-growing industry—swamped by American production. It will be remembered that years ago it was thought that American-grown corn could never compete with the home-grown product. The immense distance it had to be carried, first to the sea-

board and then by sea, and the cost of carriage, it was thought would prohibit any serious competition. It was thought also that American wheat would not be so good as the home-grown article. In fact, every argument that is being advanced to-day against the possible competition of American coal was advanced against the possible competition of American corn.

And the conditions are almost identical. America had a virgin soil, and a very productive one—enabling her to grow corn cheaply, without the expense of manures, for some years. America has also virgin coalfields which are worked at small cost, and will be for some years. America produced corn very largely in excess of its requirements; and its home markets being closed to outsiders by its tariff, the surplus was exported at low rates—the difference being made up by the price paid by the American consumer. This phase has not yet come; but it is on the way. As soon as serious competition set in between American producers themselves, and between American producers and the partially awakened English farmers, the Americans produced machinery which was adapted to all kinds of work—from sowing the seed to handling enormous quantities of grain, and so succeeded in keeping the price at which they could afford to sell on the English market below that at which the English farmer could grow.

Consequently, English wheat is becoming a thing of the past. Coal will go through the same process, unless the warning is taken in time; and there is one remedy and one only. We must fight the enemy with his own weapons. Englishmen will have the advantage of their own market if they produce as cheaply as America, and they can do so if they make use of machinery.

We have made this long quotation—from an article which, with its fellows, will we hope be widely studied in the coal industry—in order to arouse, in so far as we are able, interest in the subject, and to create a sense of its very great importance to coal consumers. There are two principal obstacles in the path of an extension of coal mining by machinery—the apathy and lack of enterprise or courage on the part of the coalowners, and the hostility of the miners. As to the first, the writer of the articles before us says:—

> Up to the present, it has been the rule for colliery managers and colliery owners to look askance at all new inventions, and only to introduce them under conditions which meant as near safety for the colliery, in a financial sense, as it was possible to go. An inventor has had a hard time in introducing his invention. Sometimes he has been given a fair trial with his apparatus; sometimes he has not. But in either case it has been thought out of all reason to alter any of the arrangements of the colliery to introduce the new invention, no matter what the advantages of that invention might be.

Such hostility or coldness towards inventions is, unfortunately, by no means confined to the profession of colliery management, and it will need no small amount of effort for its removal. Perhaps the sharp pinch of necessity will be the most effective agent. Anyhow it is very essential that it should be removed; and we trust our contemporary's warning will not fall only upon deaf or unheeding ears.

As to the second difficulty to be overcome before coal-cutting machines come generally into use—the hostility of the miners—we can only say that in their own interests and in the interests of the nation, such opposition must be overcome by the coalowners, by persuasion if possible, by other means if necessary. They would be well advised to see that the facts and necessities of the case, and the certain general benefits that would arise from the adoption of machinery throughout the mines in this country, are first and fully laid before the public; to next carefully discuss the matter with the men; and then, if the miners remained opposed to the use of machines, to fight the matter out until victory be achieved. In such a struggle, the sympathy of the public would be a valuable aid, and should be easily obtained if the case be clearly presented in the first instance. It is certainly the duty of the coalowners to leave no stone unturned in the search for means to cheapen the cost of production; and we trust that a much wider adoption of one obvious method—that of substituting machine for hand labour—will be witnessed in their operations in the near future.

Welsbach-Kern Intensifying Lamp on the Underground.—A movement is in progress for the better lighting of the stations of the Underground Railway. As frequenters of the line are aware, a change in this direction has been sadly needed for many years; and the information to hand encourages the hope of an improved condition of the stations in this respect. A definite step has been taken at the Westminster Bridge station; and it is an agreeable fact that those responsible have looked to one of the newest of the high-power systems of gas lighting to assist them in their reforming work. Their choice has fallen on the Welsbach intensifying Kern burner. Eight lanterns and intensified burners have been erected on each platform; and seven lanterns and intensified burners on the bridge, in the entrance, and the subway to the House of Commons. There is one three-light cluster lamp outside the station; but the others are all single lights, giving from 280 to 300 candle power. The offices have also been fitted throughout with No. 3 Kern burners, numbering 24. The new burners displace 64 flat-flame burners and five Wenham lamps. It is calculated that the increase in illuminating power is more than 6000 candles, with a considerable decrease in gas consumption. The lighting of the station is now remarkably good; and it will no doubt give as much satisfaction to the authorities as it is bound to do to the users of the station, who have hitherto had much cause of complaint.

ELECTRIC LIGHTING MEMORANDA.

The Electrification of the Metropolitan Railways—Objections to the District Scheme—Intervention of the Board of Trade—The Decision of the House of Commons Committee.

THERE is a serious split in the electricians' camp over the proposed electrification of the Metropolitan Railways. We have told the story of the District line, down to the point where the Directors handed over the fortunes of the undertaking to the American combination that had already acquired a controlling interest in the Company's ordinary stock. In America, of course, this would have been a final settlement; people in that Land of the Free being still in the happy position of having power to do as they please with their own. In this country, however, such liberties as subjects of the King possess must be exercised according to the British Constitution; and one of the long arms of the Constitution is flung round the property of every statutory Company. Consequently, the District "deal" had to go before a Committee of Parliament, to whom Mr. J. S. Forbes, the Chairman, told the same flattering tale about its advantages that he had already recounted to the proprietors—with the difference that his story was understood to be good only until another should be told. This has now been done, with the result that the great American enterprise was exhibited in another light. Even in the case of Mr. Forbes, the complication of the Metropolitan interest—the original "Underground"—was admitted to be a difficulty. The Americans had not bought the Metropolitan, as they had bought the District; and Mr. Forbes was fain to admit that the two Boards were not in the same boat in this business. Inasmuch as the Inner Circle line is divided between the two Companies, this disagreement was obviously most awkward. Confronted with the difficulty, Mr. Forbes lightly brushed it aside with the assertion of the right of the District Company to look after themselves without respecting the prejudices of their co-proprietors of the Inner Circle.

Before the Committee, Colonel Mellor, Chairman of the Metropolitan Company, said that the Joint Committee of the two Companies that had had the subject of electric traction under their consideration worked loyally together, and had practically agreed upon the Ganz system, when Mr. Yerkes came upon the scene with the attraction of his million sovereigns; and the District people succumbed. Then other things followed. The Americans wanted £400,000 for a power station, whereas the Joint Committee had already received a tender for the erection of a power station for £200,000. This change frightened off the Metropolitan, who did not want to be bound to support a scheme involving such grievous expenditure. Let us observe, in parentheses, that all this talk as between Americans and Hungarians for the electrical equipment of the Metropolitan railways of England has not a pleasant sound. The two Companies owning the Inner Circle lines are both faced with the alternatives of electrification or death; but whereas one of them remains free to choose the means of escape from the worse fate, the other has ceased to be a free agent. Again, the witness of Mr. Forbes to the power of the Almighty Dollar smacks of the consentment of the Apothecary in "Romeo and Juliet." One does not like to think of the directorate of an important English railway in such a strait.

The facts being as stated, however, the Directors of the Metropolitan Company had no other hope of deliverance than such as might be advised by a Committee of Parliament. It was an extraordinary emergency; and probably for the first time, in the history of British railways, a Committee of the House of Commons was invited to force the hands of two physically connected, but financially separate, companies who wanted to act together and yet could not. The matter was urgent; for both Companies are losing heavily every week from the competition of the Central London Railway. Consequently, both Companies know what they want, and had the one desire to be ordered to help themselves to it. Eventually, the Committee rose to the occasion, and took counsel with the Board of Trade, with the result that the preamble of the Bill of the District Company was passed, with conditions. The most important of these stipulations is, that unless within one month from the passing of the Bill the two Companies shall have agreed upon an electrical system for the working of the Inner Circle and the City lines and extensions, either Company may refer the question to the Board of Trade, offering their own choice of a system. Thereupon the Board of Trade are to appoint a special tribunal, consisting of an arbitrator (not an electrical engineer) and two engineers, one nominated by each Company, to hear evidence and report to the Board. The Board of Trade will then determine which system is to be applied to the Inner Circle and its appendages. This decision is to be imperative, and is to be carried out forthwith.

The country is to be congratulated upon the fact of the Board of Trade having so promptly assumed the responsibility for dissolving the deadlock into which the precipitancy of the Yerkes combination had brought the whole Metropolitan railway system. It is not desirable that any hasty attempts should be made on the part of outsiders to prejudge the issue which will so speedily be brought before the highly competent and thoroughly impartial tribunal provided for by the terms of the District Company's Bill. There will be no chance of a holiday this year for a good many hard-working professional men, who will find themselves charged with as troublesome a task, in regard to the final settlement of this portentous business, as anybody need hanker after. The American adventurers are playing for a big stake; and it is not

to be imagined that they are afraid of any possible developments of the game. Of course, if the American electricians fail to satisfy the Board of Trade that their technic is the best, or is not so good as the Hungarian, they will receive a heavy blow; but, by way of recompense, their financial backers who have invested so heavily in District stock will find their advantage in another way. However the event may turn, the inquiry cannot fail to be of supreme interest in the actual state of the electric traction industry. The Chairman of the Committee (Sir John Kennaway), in announcing their decision, spoke the thought of all Londoners in expressing his pleasure at the prospect of the substitution of electric traction for steam on the Metropolitan lines.

A NEW VIEW OF THE HOUSING OF THE POOR, AND MUNICIPAL TRADING.

[Third and Concluding Article.]

To employ a paradox, which is often the best vehicle for conveying a truth, the housing question of London is very largely a transportation question. It is a matter of passenger trains and tramways, not exclusively of bricks and mortar. Our preceding articles have dealt with the nature of the population of the working class, which will still require shelter and house-room in the Metropolitan area during the coming century. We have shown that these people will very largely be made up of young and unencumbered units. Of course, there will always be a considerable number of families housed in London; and they will find more accommodation when the small and low houses of the cottage type, which still cover a large proportion of the Metropolitan area, are replaced, as they must be, by larger tenement blocks. A good deal of the housing difficulty actually experienced will disappear of itself in this way, if private enterprise is not choked off the field by ill-considered public action. Still, "flats" are not proper homes for rearing children in, either rich or poor; and working-class families are too large to encourage the belief that the parents will be able to spare the rent of the desirable number of rooms. Not infrequently one reads in the newspapers harrowing narratives of labouring men with a baker's dozen of children being turned into the street on account of their multitude; and really, although the statement sounds harsh, there is no room in town dwellings for such flocks of children. The State wants them, doubtless. It will be an ill day for England when the principle of the "regulated family," adjusted to the immediate and self-centred interests of parents and landlords, is established on the footing it has attained in France and elsewhere. But it is useless to deny that large families are objectionable all round in those conditions which are also breeding the housing question.

The children must go outside the towns, into a region of wide airy streets and ample playgrounds, where the houses need not be more than two stories high, and consequently will not shut out the light and the winds of Heaven. This prescription means transportation for the bread-winning members of the family, who must be carried over distances too great for walking. The manner of doing this service ought forthwith to be studied in the light of the fresh necessity now disclosing itself, by the National Government, the local authorities, and the transport companies. Hitherto, the requirement that lines of urban passenger transport should be laid out with principal regard to the needs of working people going to and from their work morning and evening, has not been observed. The idea represented by the workman's train is of recent date, and but partial realization. At best, it is only regarded as an incidental use of the railway, and a subordinate one at that. Obviously, it is only by rail or tramway that the labouring population of a great city can be carried quickly enough, and in sufficient numbers, at the proper time. Mr. A. J. Balfour's suggestion of a system of radiating thoroughfares confined to rapid traffic by means of autocars is for the present, as the "Quarterly" calls it, a counsel of perfection. Such counsels, nevertheless, are not to be shut out altogether, because it may not be possible to act upon them straightway. If the idea of them is good, it may turn out to be realizable at some time, or in some other way. The idea underlying Mr. Balfour's proposal is, we take it, that the poorest classes of the population have a claim to transport facilities which the ruling authorities ought to consider more than has hitherto been done. The size of the town, the number of their offspring, constrain them to live far from their work. This is their case for relief by improved transport services—a case which the National as well as local governments of the country dare not reject.

Let us then consider, briefly, how the claim of the working man (in this connection he is of many classes) to be carried to and from his work can be met. First, there is the railway and the workman's train. The difficulty here is the usual one, of lack of accord between the railway companies, and Parliament, and the local authorities. Happily for the country, as most people agree, Parliament has kept the railways in private hands; but, unhappily, there has been no great success about the consequential provisions intended to secure the working of the railways in the real interests of the public. As trading concerns, British railways have made a fairly good use of their opportunities; but it is no part of their business to do the Nation's work at their own expense. The railway companies have been enterprising enough in competing with one another for paying traffic; but not even Acts of Parliament have always answered in making them do unprofitable business as it needed doing. We have legislative enactments for procuring workmen's cheap trains, which are favoured with a remission of taxation; but very few railway companies lay themselves out to cater for this class of passenger traffic at the low charges which it can bear. It is impossible to argue that railway companies ought to carry workmen or anything else at a loss.

The railway companies might be assisted in this branch of their business? Precisely. But when, or in what respect, did Parliament or a local authority ever help a public service company? In respect to the railways, Parliament, in its wisdom, by the formidable machinery of a "model clause," has effectively hampered the Metropolitan lines, and done its best to prevent them from widening their ways at the town ends, whereby they might hope to make better accommodation for all their traffic. And what Parliament has spared, by way of obstruction, the local authorities have hastened to bring forward. The obligation laid upon railway companies making town extensions to rehouse those residents of the working class who are displaced by such operations, is one of the chief bars to their providing transport for the same class of people further away. How to provide for the suburban traffic is one of the nightmares of all railway officials. They cannot run any more trains on their lines appropriated to this service; and it is practically impossible to make more. Here is an example, given in the "Quarterly": The London and North-Western Railway proposed to make a new suburban station on the North-west portion of Euston Square Garden. This is not a public garden, but appurtenant to the houses, all of which the Company owned already. The London County Council and the St. Pancras Vestry opposed the Bill, and it was thrown out. The Company have since fallen back upon a much smaller and less complete scheme.

It needs someone with the mind of a Baron Haussmann, adapted to the transport question, and equipped with similar powers, to deliver London from this pettifogging parochialism. Railway companies must not occupy a bit of garden ground, nor clear away a rookery, to give themselves elbow-room; and yet, on the other hand, the authorities are for ever pegging away at them to put on more workman's trains! "Blackmail and suspicion" is the reviewer's description of the policy which local authorities are allowed to enforce against the transportation services. It must be remembered, also, that this suburban and workman's train traffic is something that has sprung up since the leading lines of railway were made. They have had to adapt themselves to it, as to an excrescence; but they cannot undertake it under conditions as favourable for its proper treatment as could be arranged for if all the lines had to be made afresh. Especially is this the case as regards station and siding accommodation. What could have been had for thousands once, would cost millions now, without bearing any immediate profit. In the existing circumstances, the great railways are in imminent peril of being overwhelmed by their accidental suburban work, which in itself is not profitable.

When we come to the case of the tramways, it is obvious that they were no more intended than the railways for a workman's or suburban service. Tramcars are meant for local omnibus traffic. In London, the circumstance of their being laid in the leading thoroughfares, as we have remarked on previous occasions in these columns, is inimical to their being worked at anything like the speed required for the proper conduct of "through" traffic. In the Eastern States of America, we read that electric tramways linking towns together, with cars actually beating in speed the steam railways, are an established solution of the transportation problem; but the high roads in that part of the world are too wide, if anything. Many of them have never even been macadamized. Several of the old high roads leading out of London are splendidly wide and straight, in these respects lending themselves admirably to electric tramway working; but they are so crowded by the miscellaneous traffic that the existing horse-cars cannot run at their best gait. How the tramways that radiate from the Elephant and Castle are to be helped in the matter of speed by the introduction of electric traction is not apparent. Fast through tramways ought to be laid in by-streets. The condition of the ends of the lines at Blackfriars and on the Surrey side of Westminster Bridge, every day from morning until late at night, illustrates the point of this contention.

There remains the case of the latest kind of Metropolitan transport service—the underground tubes. These have no history; but they are fast making it. A Joint Committee of both Houses of Parliament is sitting this session to consider the routes traced for the new lines, which are numerous. Indeed, the schemes are already too numerous for the commercial necessities of the Metropolitan traffic; and the money for their construction cannot be forthcoming. It is with regard to this reflection that the passage between a member of the Committee and Mr. Cripps, the Parliamentary Agent to the London County Council, occurred, as mentioned at the end of our preceding article. Mr. Cripps had said that the County Council felt the importance of the financial feature of the proposed railways, and thought it should be very carefully considered. Thereupon the member asked whether the Council would be inclined to help any of the lines financially, to which Mr. Cripps answered that the point had not been sufficiently considered. He was understood to say further that "it was possible that circumstances might arise which would make such a course desirable." It would, he thought, be difficult to raise the

capital for tube railways in the ordinary way, and it might therefore be necessary to seek outside assistance.

This, then, is the alternative to all that has hitherto been done and suggested by way of solving the Housing Question, to which we have already referred. It means that the London County Council and even the Treasury, forsaking their habit of cribbing and confining the endeavours of the railway companies to increase the carrying capacity of their suburban and trans-Metropolitan services, should help well-considered schemes of the kind with capital. Why not? It is in another form the precedent of the Manchester Corporation and the Ship Canal. At the cost of an annual subsidy, which the County Council might easily economize by putting a little salutary restraint upon their own Parliamentary ambitions, London could be pierced through and through with tube railways, extending towards populous suburbs, where electric tramcars might continue the lines of communication to new settlements wherein the transplanted children of the City would be able to grow into healthy, stout citizens of a younger and better London. It is unnecessary to labour the point. The principle speaks for itself, and can be worked out in detail by anyone who is sufficiently interested in this problem. We have neither space nor justification for undertaking this task, and must be content with having framed the expedient broadly and roughly. Probably, when the politicians get hold of a project built after these lines, they will forget to mention the "JOURNAL" as having been the first organ of public opinion to signalize the possibility of making such a novel departure. But so long as people are well served, it does not matter who originates the method of service.

THE GAS AND WATER STOCK MARKET.

(For Stock and Share List, see p. 105.)

THE Stock Exchange had a terribly quiet time last week, but that should cause no surprise. In this age of progress, it has grown to be pretty well recognized that business must give way to pleasure, and be exercised only in the intervals accorded by the latter. Thus the paramount attractions of Henley and Lords drew their devotees away last week, and Capel Court became for the while a mere reminiscence. In the inanimate condition thus induced, almost everything drooped, and quotations in general are weaker. The American market was the chief sufferer; the heat of Wall Street having melted prices. The Money Market was active enough; but all requirements were met with the utmost facility, and rates remain easy. Business in the Gas Market was somewhat irregular; but there was somehow or other more activity than in the preceding week. The general tendency was fair and steady. Movements in value were few and slight; but they were almost wholly in the upward direction. The first half of 1901 being now completed, the Companies' accounts will be expected with interest. It may perhaps be forecast that, as a general rule, they will be found to show that business has been steadily maintained, notwithstanding the high price of gas caused by the rise in coal. Gaslight and Coke issues were more active last week, both ordinary and secured, and changed hands at good, steady figures without evincing any disposition to vary. South Metropolitan was quieter but firm, and at the close buyers raised their price a point. Nothing at all was marked in Commercials; but the debenture had a good rise. The Suburban and Provincial group remained almost untouched in the London market; but locally Liverpool advanced a point. There was some dealing in Imperial at prices which tended to improve; but the other Continental Companies were quite neglected. Among the remoter undertakings, Oriental had another rise, and Cape Town improved; while there was some brisk dealing in San Paulo without change. Business in the Water Companies was dull and devoid of interest; and all quotations remained unchanged.

The daily operations were: Not much was done in Gas on Monday, and changes were few. Cape Town rose ¼, while River Plate debentures fell 1. Tuesday was a little busier, and prices were steady. Cape Town debentures improved 1. Wednesday's transactions were mostly in Gaslights at hardening figures. Oriental rose ¼. Thursday's business was divided between Gaslight and San Paulo; but quotations did not move. Friday was fairly active and strong. Commercial debenture advanced 3. Saturday was extremely quiet. South Metropolitan rose ½.

Standardizing Iron and Steel Sections.—A Committee has been appointed by the Institution of Civil Engineers, with the support of the Institutions of Mechanical Engineers and Naval Architects and of the Iron and Steel Institute, to consider the advisability of standardizing the various kinds of iron and steel sections, and, if found advisable, to consider and report as to the steps which should be taken to carry such standardization into practice. The Committee is composed as follows: Mr. James Mansergh, President of the Institution of Civil Engineers, Sir Benjamin Baker, K.C.M.G., Sir John Wolfe Barry, K.C.B., Sir Frederick Bramwell, Bart., Sir Douglas Fox, Mr. G. Ainsworth, Mr. William Dean, Mr. A. Denny, Mr. J. Allen M'Donald, Mr. E. Windor Richards, Mr. James Riley, Professor W. C. Unwin, F.R.S., and Dr. J. H. T. Tudsbery (Hon. Secretary). Mr. Leslie S. Robertson, M.Inst.C.E., of 28, Victoria Street, S.W., is Secretary to the Committee, who have already commenced their investigation.

PERSONAL.

Mr. NORMAN S. COX, son of Mr. J. H. Cox, Secretary and Manager of the Sunderland Gas Company, has been appointed Assistant to Mr. C. Dru Drury, the Works Manager at Hendon, in succession to Mr. J. H. Wright, who, as mentioned below, has entered the service of the Sheffield Gas Company.

At the monthly meeting of the Directors of the Derby Gas Company last Wednesday, Mr. H. Swingler, J.P., D.L., presiding, Sir HENRY HOWE BEMROSE, J.P., was unanimously elected a member of the Board in the place of the late Alderman Thos. L. Riley, J.P. Sir Henry was Member of Parliament for Derby from 1895 to 1900, was elected Mayor of the borough in 1877, is an Alderman, and was knighted in 1897 in recognition of his public services.

Mr. J. R. HILL, the Acting Manager of the Rochdale Road gas-works of the Manchester Corporation, has been appointed Manager of the Bradford Road works, in succession to the late Mr. William Rodger; Mr. J. S. NAYLOR, the Deputy-Manager at Bradford Road, replaces Mr. Hill at the Rochdale Road station; Mr. JOHN TAYLOR becomes Deputy-Manager at Bradford Road; and Mr. G. W. TOOLEY has been appointed Deputy-Manager at Rochdale Road.

Mr. JOHN HENRY LLOYD, the Chairman of the Birmingham Corporation Gas Committee, is (as we announced last week was likely to be the case) to be the next Lord Mayor of the city. Alderman Lloyd, the father of the Lord Mayor elect, was Mayor of Birmingham 31 years ago; and happily he is still a member of the Council. This will be the first occasion on which a son has followed his father in the office of Chief Magistrate of the city during the time the father was a member of the Corporation. Mr. J. H. Lloyd was appointed a member of the Gas Committee on his election to the Council in 1891; and on the retirement of Mr. Maurice Pollock in 1898, he was elected Chairman of the Committee. The prospective honour of Mr. Lloyd appears to have been offered with a gratifying unanimity.

A very pleasant gathering took place at the Anchor Tube Company's works, Birmingham, last Thursday, on the occasion of the staff and workmen recognizing the severance of the 25 years' connection of Mr. WILLIAM JONES with the Company as representative. A solid silver tea service was presented to him by Mr. Hewson Bonsor, his colleague, who alluded to the spontaneity with which all the officials and workmen had entered into the spirit of the presentation. Mr. Jones, in responding, referred to the good-fellowship which had always prevailed between himself and them; intimating that it arose from the kindly interest which was always evinced by Mr. Theodore Turley and his sons (partners in the Anchor Tube Company) towards all connected with them. He expressed the hope that, in his new position with the firm of Messrs. Thomas Cash, Son, and Co., the same cordial relationship would exist.

On Saturday, the 29th ult., Mr. JAMES WADESON retired from the position of Engineer and Manager of the Windsor Royal Gas Company, which he had held for upwards of 45 years. The opportunity was chosen by the employees of the Company for testifying their high esteem for him; and they did this in the form of an illuminated address, which was presented on their behalf by Mr. Richard Gray, the senior employee. It was enclosed in a neat oak frame, and accompanied by a silver salver. It expressed the fervent wish of the donors that Mr. Wadeson's well-earned rest might be blessed with health, happiness, and comfort for many years to come. The presentation came as a complete surprise to the recipient, who briefly acknowledged the testimonial. We may add that Mr. Wadeson has been granted a substantial superannuation allowance by the Company for his long and faithful services; and he retires with the good wishes of his numerous friends and acquaintances. His successor (Mr. Herbert Buckley) took up his duties on Monday last week.

Last Thursday afternoon a presentation was made at the Hendon works of the Sunderland Gas Company by the officials and workmen, to Mr. J. H. WRIGHT, Assistant Works Manager, who is leaving to take charge of the Effingham Street station of the Sheffield Gas Company. Mr. J. H. Cox, the Secretary and Manager, presided over a large assembly of officials and workmen; and in opening the proceedings referred to the esteem in which Mr. Wright was held by all who were associated with him, and the respect he had gained during his 7½ years' service with the Company. He asked Mr. C. Dru Drury, the Works Manager, to make the presentation, which he did in a few suitable words; expressing the hearty goodwill felt by those present towards Mr. Wright, and their wishes for his future happiness. He at the same time handed to Mr. Wright a handsome gold watch, suitably engraved, and also asked him to accept, on behalf of his wife, a small present in the shape of a cake-basket. Mr. Drury's remarks were supported by Mr. F. G. Kitts, of the general office staff, and Mr. J. Hope, on behalf of the workmen. Mr. Wright, in acknowledging the gifts, alluded to the kindness he had always met with from those around him; and the proceedings closed with cheers for him and Mrs. Wright.

After a service extending over many years, Mr. WALTER FIDDES was compelled, about two months since, to relinquish his position as Engineer of the Bristol Gas Company, owing to ill-health. It may be remembered that at the meeting of the Southern District Association in March it was announced that he

had been unable to attend to business. In the circumstances the Directors asked Mr. D. IRVING, Engineer of the Company's Stapleton Road works, to temporarily fill the vacant position at Canons' Marsh; and we are pleased to learn he has now been duly installed therein. He has had an opportunity of showing his capabilities in both rough and smooth times; and he must of necessity be more familiar with the inner working of the manufacturing department of the undertaking than any stranger could be. Moreover, in selecting him for President of the above-named Association, his professional colleagues testified their appreciation of his worth. We think the Directors have acted judiciously and justly in conferring the appointment upon Mr. Irving, and we trust the undertaking will continue under him its successful career. Another source of gratification in connection with the change in the management is the recognition by the Company of the faithful services rendered to the undertaking by Mr. Fiddes, by granting him a pension, which we sincerely hope he may live many years to enjoy.

We learn that the successful candidate for the appointment of Resident Manager of the Sutton, Southcoates, and Drypool Gas Company, applications for which were invited in the "JOURNAL" for the 4th ult., is Mr. JOHN HOLLIDAY, Assoc.M.Inst.C.E., F.C.S., the Engineer and Secretary of the Scarborough Gas Company. Mr. Holliday, it may be remembered, was a pupil of Mr. Joseph Hepworth, at Carlisle, and on the completion of his articles he became that gentleman's chief assistant—holding the position for three years. In December, 1891, he entered the service of the Scarborough Gas Company as Deputy-Manager under the late Mr. W. J. Moon. When Mr. Moon's health failed towards the close of 1893, his duties devolved upon Mr. Holliday, who was promoted to the position of Engineer and Secretary upon his chief's retirement at the end of the year. Mr. Moon's services were retained as general adviser of the Company; but he did not live many days to render them—his death having occurred on Jan. 15, 1894, in his 56th year. At the outset of his career, Mr. Holliday identified himself with the Gas Institute, having entered as an associate member in 1890, while he was in Carlisle; and he was transferred to the class of members four years later. He joined the North of England Association in 1890, and he has contributed useful papers to both Societies. We heartily wish him success in his new sphere of labour.

OBITUARY.

The death is announced of Mr. ALFRED HENRY STILL, of Cork, at the patriarchal age of 92 years. From the commencement of the Cork Consumers' Company until a recent period, he held the appointment of Chief Engineer.

The Croydon Gas Company have just lost by death an official who had been in their service for more than 33 years. After two weeks' suffering from rheumatic fever, Mr. ROBERT JAMES HARTLEY, the Assistant-Accountant, died on the 2nd inst., at the age of 57. As a prominent member of the choir of the Parish Church, and for a long time Librarian of that body, he was well known in Croydon; and his death will be regretted by a large number of friends.

In addition to the loss mentioned above, the Company have been deprived of the services of one of the Directors, by the death, on the 29th ult., of Mr. GEORGE B. JACKSON, at the comparatively early age of 49. Deceased was Chairman of the Carshalton Gas Company, which a few years ago was amalgamated with the Croydon Company—Mr. Jackson then joining the Board. Apart from his capacity for business, he was a man who possessed considerable literary, artistic, and histrionic ability; and the pleasure caused by the exercise of these gifts made him a most agreeable companion. He was a skilled conversationalist on many interesting topics; and withal, no one was more amiable, unassuming, and courteous. A very large circle of friends will regret the pleasant connection which has been severed by the sad event we have recorded.

TECHNICAL RECORD.

SOCIÉTÉ TECHNIQUE DU GAZ EN FRANCE.

Programme of the Forthcoming Meeting.

The final arrangements for this year's meeting of the French Gas Society and of their visit to London have just been issued. The programme extends from the morning of the 18th inst. to the evening of the 24th. As previously announced, Dieppe is the place of meeting for the first three days, when the ordinary business will be transacted, the papers read, and the annual dinner held. The last three days are to be spent on this side of the Channel, and a full programme has been arranged for the entertainment of our French colleagues, who will arrive at Brighton on the evening of the 21st inst. The following morning (Monday, the 22nd), a visit will be paid to the Brighton Gas-Works, after which luncheon will be provided by the Gas Company. London will be reached at five o'clock the same evening; and two hours later our visitors will be entertained at dinner at Earl's Court, by the Directors of the Imperial Continental, Continental Union, and European Gas Companies. On Tuesday, the 23rd, the three London Gas Companies will play the part of the host. Visits will be made to the Beckton and Greenwich Gas-Works; both lunch and dinner being offered to the members of the Society and their wives. Wednesday—the last day of the visit—will be taken up by a glance at a few of the sights of London, when a parting luncheon at the Hotel Cecil, the *rendez-vous* of our visitors, will be given by the Gas Institute and the Institution of Gas Engineers, to which also the ladies of the party are invited. At nine o'clock the same evening the return journey to Dieppe and Paris will be commenced. The programme promises very well, and everyone, we are sure, will be ready to extend the heartiest welcome to our hospitable hosts of last year.

With regard to the business portion of the proceedings, there is a list of 21 papers, which will form the technical fare of the two opening days of the meeting. A large number of them deal with the questions of the enrichment of gas and of incandescent burners. There is also a "Note on a Charging-Machine," by M. Cabrier; a paper on "The Mechanical Conveyance of Coal and Coke in Gas-Works" has been prepared by M. Laurain; while M. Dulac will write on "An Automatic Apparatus for Weighing Coke." M. Lecomte contributes three different papers on "The Photometry of Incandescent Mantles" and "The Enrichment of Gas by Benzol;" and there are several other communications on kindred subjects. In fact, both the technical and social sides of this year's meeting of the Société Technique are well filled, and show continued signs of mental and physical activity.

THE LARGE GASHOLDER FOR NEWCASTLE.

(*Continued from p.* 26.)

In last week's issue, we completed the description of the new gasholder tank of the Newcastle and Gateshead Gas Company on the site of the projected works at St. Anthony's, and now have to deal with the holder itself. This at the time of the inspection by the members of the North of England Gas Managers' Association was in course of erection; but, with them, we were able to judge of the excellent character of the work which Mr. W. Doig Gibb has ensured for it by his plans and specification. The Whessoe Foundry Company are the contractors; and the structure, so far as it has proceeded, gives promise of a faithful reproduction, in every particular, of the design. One of the drawings referring to the holder is given as a supplement to this week's "JOURNAL."

Following the course adopted in the case of the tank, we will first briefly refer to the quality of the material which Mr. Gibb specified should be used in the holder. Except in minor parts, the holder and guide-framing are being constructed throughout of Siemens-Martin mild steel, capable of sustaining a tensile strain of from 28 to 32 tons per square inch of section, with an elongation of 20 per cent. in 8 inches. The wrought iron used is to be capable of sustaining a tensile strain of 22 tons per square inch of section, with an elongation of not less than 10 per cent. in 8 inches; and the similar requirements for the rivet iron are 26 tons, and 12 per cent. in 8 inches. The conditions laid down for the castings will ensure that those used are clean and sharp, and free from flaws of any kind. The quality of the cast iron is to be such that a bar 2 in. by 1 in. and 3 ft. 6 in. long, when supported at points 3 feet apart, loaded in the centre, will sustain a weight of not less than 28 cwt. for a period of 24 hours.

Regarding the general construction, all holes in plates, bars, angles, and tees are being drilled, and the holes in the sheeting punched. The edges of plates and abutting ends of all parts are planed or otherwise machined; and riveting, as far as practicable, is being done by machine. All rivets above $\frac{3}{8}$ inch diameter are put in hot; and, wherever necessary, the rivets are countersunk. Before riveting the plates and sheets together, the joints of each are well painted with red-lead paint, and a broad tape, saturated with oil and red lead, inserted.

Coming to the holder, its construction requires more detailed treatment. It will consist of three lifts—the outer one being 236 feet diameter and 45 feet deep; the middle one, 233 feet diameter by 44 feet deep; and the inner one, 230 feet diameter and 44 feet deep. Dealing with the outer lift first. The top and bottom rows of sheeting will be $\frac{3}{8}$ inch and $\frac{1}{2}$ inch thick respectively, and 3 feet wide; and the second row of plates, top and bottom, $\frac{1}{4}$ inch thick and 3 feet wide. The whole of the intermediate sheeting will be No. 10 B.W.G. in thickness. There will be 52 vertical strips 1 ft. 6 in. wide and $\frac{3}{8}$ inch thick, riveted to the $\frac{3}{8}$-inch and $\frac{1}{2}$-inch plates at the top and bottom, and running the full height of the lift between. There will be 52 channel steel guide bars, the full depth of the lift, 6 in. by 3 in. by $\frac{1}{2}$ in. by 19 lbs. per foot, secured to the sheeting inside by means of 3 in. by 3 in. by $\frac{1}{2}$ in. angle-steel ears, and 104 channel steel bars on the outside, $3\frac{1}{4}$ in. by 3 in. by $\frac{1}{2}$ in. by 15 lbs. per foot, riveted to the 18 in. by $\frac{3}{8}$ in. strips, 6 inches apart. The bottom curb will be composed of two 9 in. by $\frac{5}{8}$ in. plates, and three $4\frac{1}{2}$ in. by $4\frac{1}{2}$ in. by $\frac{5}{8}$ in. angles, riveted with $\frac{7}{8}$-inch rivets, 6-inch pitch. The hydraulic grip will be composed of 12 in. by $3\frac{1}{2}$ in. by

⅝ in. steel channel, weighing 37 lbs. per foot run, and ⅜-inch steel plate, 2 feet wide, riveted together with ¾-inch rivets, 2½ inch pitch. The lower edge of the steel plate will be stiffened by means of a bead of 3 in. by ½ in. half-round iron riveted to it, with ¾-inch countersunk rivets, 6-inch pitch. The joints in the channel will be covered with ⅝-inch plates, 2 ft. 4 in. long. There will be 104 rest-pieces in the grip riveted to the channel, with ¾-inch rivets, and spaced equidistant round the circumference.

The top carriages, formed of steel plates and angles, riveted together, will be 26 in number. They will be fitted with turned cast-iron rollers, 12 inches diameter by 3½ inches wide on face, working on turned pins of forged steel 2 inches diameter, reduced to 1¾ inches diameter at the ends. The rollers will be bored out, and fitted with ⅝-inch steel bushes. The carriages will be provided with slot holes, and have adjusting plates 4½ in. by ⅝ in. thick, each secured with ¾-inch studs. These adjusting plates are to be cut to length, and fitted in when the rollers are in final position. A small angle stay, composed of ⅜-inch plate and 3 in. by 2½ in. by ½ in. angles, will be riveted to the 12 in. by 3½ in. channel at the back of each 3½ in. by 3 in. by ½ in. vertical channel.

The bottom carriages, which will be fitted in between the 9 in. by ⅝ in. plates of the bottom curb, will number 52. They will be composed of ⅝-inch plates and 3 in. by 3 in. by ⅝ in. angles riveted together and to the curb, and fitted with turned cast-iron rollers, 12 inches diameter by 3½ inches wide on face, working on turned pins of forged steel 1¾ inches diameter, reduced to 1½ inches diameter at the ends. The rollers will be bored out, and fitted with ⅝-inch steel bushes. The carriages will also be provided with slot holes, and have adjusting-plates 4½ in. by ⅝ in. thick, each secured with ¾-inch studs. Fixed between the ⅝-inch plates of the bottom curb, midway between the bottom carriages, will be 52 intermediate stays, formed of ½-inch plate and 3 in. by 3 in. by ½ in. angles. There will be an oval manhole in the lower tier of ½-inch plate, 2 ft. by 1 ft. 6 in. clear opening, with ⅜-inch cover, secured by ⅝-inch studs, and having 3 in. by ½ in. welded ring riveted inside.

In the main, the description of the outer lift applies to the middle one. The measurements of the sheeting will be the same; as will be also the number and dimensions of the vertical strips, the inside channel steel guide-bars, and the outside channel steel bars. The hydraulic cup and grip will be composed of 12 in. by 3½ in. by ⅝ in. channel steel and ⅜-inch plate, with 104 rest-pieces in the cup and the same number in the grip. The 26 top carriages will be fitted with main rollers of cast iron 1 ft. 6 in. diameter, and 4 inches wide on face, and in other respects similar to the rollers on the outer lift. Each carriage will also be provided with two side rollers, working at right angles to the main roller. Each of these rollers will work on the end of a forged rectangular bar, 3 in. by 2½ in., reduced to 1¾ inches diameter in the roller, and secured to the plate by means of 1½-inch adjustable bolts. The carriages will be securely held in position by means of winged stays of 5 in. by 3 in. by ⅝ in. angle steel. The 52 bottom carriages in this case are formed of ½-inch steel plates and 3 in. by 3 in. by ½ in. angles riveted together and to the underside of the hydraulic cup. The rollers are 10 inches in diameter by 3½ inches wide on the face, working on turned forged steel pins 1½ inches diameter, and reduced to 1¼ inches diameter at the ends. The carriage adjusting-plates in this case are 3½ in. by ⅝ in. Provision is made for a manhole, the same description and in the same position, as in the outer lift.

A more liberal treatment will be required for the inner lift and crown. In the case of the former, the top row of plates next the curb will be ⅝ inch thick, and the next row ¼ inch. The bottom row of plates next the cup will be ⅝ inch thick, and the next row ¼ inch. No variation is made from the outer lift in the intermediate sheets and the vertical strips. There will be 52 vertical stays of girder section formed of 3 in. by 3 in. by ½ in. angles and ⅜-inch web plates, and braced together with 2½ in. by ⅜ in. lattices. The angle frames are welded solid; and the top of the stays shaped out to fit the rise of crown. The hydraulic cup will be similar in all respects to that of the middle lift. The top curb will be formed of angle steel 6 in. by 6 in. by ⅞ in., properly splayed out to fit the rise of crown, and set to the radius of the holder. It is to be in lengths of not less than 14 feet, and jointed with covers 3 feet long by 5⅛ in. by 5⅛ in. by 1 in. The rivets through both legs of the angle will be ⅞ inch diameter and 4-inch pitch zigzag. There will be a circular stay composed of 12 in. by ⅜ in. plate, and two 6 in. by 4 in. by ½ in. angles running right round the underside of the crown at the top end of the vertical stays, and riveted to the crown-plates and vertical stays. The angles will be riveted to the plate by means of ¾-inch rivets, 6-inch pitch, and will be jointed with 5½ in. by 3½ in. by ⅝ in. covers, 3 feet long. The plate will also have covers 2 ft. by 12 in. by ⅜ in. Round the bottom of the lift, and running from one vertical stay to another, will be horizontal stays of T-steel, 6 in. by 4 in. by ½ in. These stays will have the ends properly smithed to the angle, and will not be set to the curve.

In the case of this lift, the 26 top carriages will be fitted with main rollers, 2 feet diameter, working on turned pins of forged steel 2½ inches diameter, reduced to 2¼ inches at the ends. As in the middle lift, each carriage will be provided with side rollers of similar description. The carriages will be securely held in position by means of wing stays of 5 in. by 3 in. by ⅝ in. angle steel, and will each be fixed to the crown by means of 22 studs, 1 inch diameter, screwed through ¾-inch plate, and having nuts above and below. The bottom carriages will also be as in the middle lift, but will be riveted not only to the underside of the hydraulic cup but to the back of the vertical stay. The description of the bottom carriage rollers of the middle lift will again apply here.

The ⅝-inch plates in the top row of the lift will be butt-jointed, with cover strips, 8 in. by ¾ in., riveted with ⅞-inch rivets. The outer row of crown-plates will be ¾ inch thick and 4 feet wide, and butt-jointed with 9 in. by ⅞ in. covers. The next row of plates will be ½ inch thick by 4 feet wide, and butt-jointed with 7 in. by ⅝ in. covers. The third row of plates will be ⅜ inch thick and 3 feet wide, lap-jointed. The centre plate will be 6 feet diameter by ⅜ inch thick, and the next row ¼ inch thick by 5 feet wide. The whole of the intermediate sheets will be No. 9 B.W.G. in thickness, and will be radial.

In the crown there will be two circular manholes, 3 ft. 6 in. diameter with ⅜-inch covers, and 3½ in. by ½ in. rings inside. These covers will be secured by ¾-inch set-studs, tapped through the crown-plate and ring; and the manholes will be arranged to come directly over the inlet and outlet pipes. There will also be a circular manhole, 2 ft. 6 in. diameter, in the centre of the middle crown-plate, fitted with ⅜-inch cover and 3 in. by ½ in. welded ring, and having a short 3 inches diameter double-flanged piece riveted on the centre to take the blow-off cock. The crown will rise 20 feet in the centre from the horizontal line, and be set out to a true curve, with a radius of 340 ft. 7½ in.

(To be concluded).

WESTERN (U.S.A.) GAS ASSOCIATION.

(Concluded from p. 27.)

A paper on the "Taxation of Gas Companies" was read by Mr. George M'Lean, of Dubuque (Ia.), who contended that gas companies should be treated exactly on the same lines as private firms or individuals. He did not intend to imply that franchise or intangible value should not be taxed. According to the Iowa State law, the real estate, material, money, and credits *only* of manufacturing companies were taxable. If a gas company was not a manufacturing company, the intangible value would be subject, under another section, which provided that *all* property subject to taxation should be assessed at 25 per cent. of its actual value. Section 1343 of the Code of Iowa made special provision for the taxation of gas companies; and section 1323 provided for the taxation of shares and stock. His contention was for equality, and against denying to the public service company the exemptions which, in practice though not in law, were conceded to others. He did not argue against taxation of intangible values. But if one class was to be taxed, all should be taxed; and if one was to be exempted, all should be exempted. There should be one rule for all, whether companies, firms, or individuals. If market value was the basis for one property, it should be the basis for all property. It was admitted that if the law as above stated was impartially enforced, the companies in Iowa would pay less taxes, and that the law was not enforced against them, as the Assessment Board, in fixing the valuation, took into consideration the fact that it was not enforced against others. But there was a demand for a special method of assessing public companies that would prohibit the Assessment Board from exercising this discretion, and substitute a hard-and-fast line based on the market value of the capital. While admitting that this was not in accordance with the equality above contended for, he urged in justification that the gas companies possessed special privileges. This was not true in Iowa, as that State did not grant exclusive privileges or regulated monopolies; and the citizens had the privilege of chartering any number of gas, water, or other companies. Gas companies had nothing like the value represented by a valuable patent, a special brand of goods, or a well-established name or connection in business. Yet the assessors never valued these things. The gas company should be assessed as any other manufacturing company. It was not generally and necessarily true that the invested capital of a company was much greater than the structural value of its property. In his experience, the capital invested in public companies in Dubuque during the last thirty years had not earned the prevailing rate of interest on a first-class mortgage; nor was the amount of capital an index of the profits. Persons who took the risk of investing capital in starting a gas undertaking considered the possibility of the stock increasing in value. Such increase in value might be against the public interest, but it was the chief inducement; and if destroyed by a 2 per cent. tax on capital, it would drive investors into other fields where the risk was not so great. If a public company was making exorbitant profits, an increase of its taxable value was not the right direction in which to look for a remedy. The franchise or intangible value of a property was in no sense the gift of the public, but the result of personal ability and enterprise; and any attempt to tax such results must tend to arrest the development of public utilities. If the franchise was a gift, why tax it? Why not confiscate it? The abuses which had led to the demand for such a tax might be traced to charters in which the public interests had not been properly protected; and the limitation of the discretion allowed to the Assessment Board did not meet the case.

Mr. Enright opened the discussion by inquiring if there was a

State Valuation Board in Iowa, who were looking after the valuation of public companies with a view of putting a new tax on the difference between real property value and the market value of the capital. Being answered in the affirmative, he mentioned that in Missouri something of the same sort was attempted, but stubbornly resisted by railway, telegraph, and other companies; and the objectionable features were defeated. Companies now had a right of appeal to the County Board; and if dissatisfied with the decision, to test it in Court. The matter did not excite any great attention among the gas companies. Many supposed that inquiry would bring out the fact that there was not a great difference between capital value and real estate. Mr. Pratt agreed with the argument advanced in the paper, and said that the laws in the Western States were a little peculiar in several respects. Many of their assessments were simply guesswork—no pretence at examining the property being made. Mr. T. D. Miller gave an example showing that a partnership concern had successfully objected to a franchise tax; while companies whose franchises were exactly similar in character did not escape. In common fairness, either the partnership should be taxed, or the company should not. He submitted that goodwill was not taxable. One company might be badly managed—paying no dividend and having no franchise value; another, in a town precisely similar, having been well managed, paid a good dividend, and therefore had a franchise value. The thing might be applied to a professional income, which depended entirely upon personal ability. Would the handsome income earned by a first-class lawyer be assessable? The theory put a discount on activity and skill, and a premium on idleness. But in some respects franchise value contributed to the taxes. Property at a prominent street corner might command a much greater rent than one of similar structural value in a bye-street, and would therefore be taxed at a higher rate; but the tax was indirectly paid by the person who found he could afford to pay the high rent. With gas-works there must be a difference between structural and actual value, because it was the right to do business that rendered the plant valuable. Take away that right, and it would scarcely pay for breaking up. He thought the franchise tax in some form or other would have to be accepted. Mr. A. E. Forstall said it was evident, as he remarked at the last meeting, that the time was coming when gas companies would be controlled, whether they liked it or not; and it was for them to see that the control was put into a shape in which they could get something out of it. Mr. M'Ilhenny thought that if the consumers were made to see that they really had to pay the tax, and not the shareholders, there would be less clamour for its imposition.

Mr. A. H. Barrett, of Louisville, read a memorandum on the "Results of Six Months' Operation of Inclined Retorts," during which time he carbonized about 25,000 tons of coal. The average sales per ton of coal were: Coke (lump and broken), 24 bushels; tar, 13¼ gallons; liquor, 220 liquor ounces. Average quality, 17⅛ candles. The quantity of coal carbonized per man was 10½ tons; cost of labour per ton, for crushing and charging, 3¼d.; cost of discharging and quenching, and storing coke per ton of coal carbonized, 3¼d. The average yield was 4·65 cubic feet per lb. A considerable quantity of nut and slack coal was used; and there was no trouble from slipping, except that due to pockets of dust, whether dry or wet. Replying to questions, he said that the bushel of coke was a measured bushel of 2688 cubic inches. There was no difference in yield as compared with horizontals; but he could use a larger proportion of small in the inclined retorts, and yet keep up the yield. He had not met with any special difficulties. The bad appearance on discharging was simply due to the accumulation of a little tar in the mouthpiece, which flared up and made a good deal of smoke. It was necessary to exercise greater care with regard to the heats, as the charge must be fairly well worked off, or it would not come out. The heating problem was the most trying one in connection with the system. The yield of gas per stoker was increased nearly 250 per cent. The coke was not broken so much as with horizontals; and a larger proportion of lump was available for sale. He did not include the breeze in the 24 bushels. He ran six-hour charges of 720 lbs. each. There was no additional trouble with the stand-pipes; and the removal of carbon practically caused no trouble. The retorts would run three or four months, and then standing off for half-an-hour or so was sufficient; so that there was practically no standing off for cleaning. This would lead to a marked increase in the life of the retorts.

Several speakers agreed that the sales of coke above indicated showed a consumption of about 18 per cent. of the coke produced in the retort-house. Mr. Beal said that, with horizonal retorts, his average for the last four months per 100 lbs. of coal was: Coke made 70 lbs., sold 49·8 lbs.; breeze sold 9·1 lbs., used in the retort-house 11·1 lbs., or about 16 per cent. of the total make of coke. Mr. Forstall said that, as the result of careful tests of Westmoreland coal, the yield of coke was 13 cwt. per ton. Lump coke would not weigh 40 lbs. to the bushel; 37 or 38 lbs. was nearer the mark.

Mr. E. W. Bell, of St. Louis, read a paper on "Prepayment Meter Accounts and Records," describing a method in successful operation over 5000 meters. He used both the loose leaf system, in which loose leaves are filed in special holders and binders provided with locks, and the card index system, in which cards of uniform size are stored in drawers. In either system the filing may be alphabetical, geographical, or on any convenient plan; and new cards or leaves can be readily added at any place, or old matter taken out. The cards used included: (1) Applications for fixing, removing, or transferring meters on cards, containing also the rules and regulations and signed by the customer giving the order. (2) With tickets for showing the execution of the order, giving all necessary detail. The size was 3 in. by 5 in. The loose sheets included (3) daily records 17 in. by 22 in., with lines for entering up fifty of the No. 2 tickets. (4) Loose leaves for the consumers ledger, 8½ in. by 11 in., ruled in the usual manner. (5) Meter route books, with detachable coupons. (6) Complaint book, with the same for entering complaints as received. The method of operation was as follows: All applications No. 1 were investigated; and, if in order, a work-ticket No. 2 was issued from the office, assigned to the proper workman, and, after completion of the order, returned to the shop with all details filled up. The tickets are assorted under convenient headings, such as meter-work, &c., and entered on the daily record sheets, which are in duplicate; one copy being retained and filed, while the other is sent to the office, where they are checked with the original orders. The various daily record sheets were dealt with as may be necessary. For instance, the meter work-sheet gave details for the consumers' ledger and meter route book. In taking meter statements, collecting, and handing over coin, &c., each inspector received a route book, coin bag, and padlock key. At the end of the day, he returned his book and the money taken to the office, receiving a receipt for it, and also a report as to any bad money found, or other special circumstance. Another clerk received the coin-bag, key, and a statement as to the amount taken. The total cash was checked with the route-book entries, by the aid of a calculating machine. From the route book, the ledger leaves were posted up, and afterwards the coupons were removed and filed. The scheme provided a complete record and index, and ensured a thorough check on all ledger accounts.

The discussion turned entirely upon the advisability or otherwise of pushing prepayment meters. All were agreed as to their advantage in the case of small or doubtful consumers; but against this, the cost of the appliance was urged, and the fact that many ordinary consumers demanded to be changed over. Mr. Moses said that at Camden, while the minimum for ordinary meters was 2s. 1d. per 1000 cubic feet per month, that for slot-meters had been put at 4s. 2d., in order to check the demand. Mr. Pratt and Mr. Baehr were considering how to check the demand.

After considering the contents of the Question Box, receiving a report from the Committee on National Advertising, a report from the Memorial Committee, which included a high tribute to the memory of the late Mr. G. T. Thompson (who will be remembered by many English gas engineers as having visited their works), and other business, the meeting adjourned.

Excessive rust deposits in the pipes of the Attleborough (Mass.) Water-Works have been caused by the large quantities of carbonic acid gas and oxygen in the water. These attack lead or wrought-iron pipe, even when galvanized, though tin-lined, cement-lined, or cast-iron pipes are unaffected.

Among the resolutions of the Gas Committee of the Manchester Corporation submitted at the meeting of the City Council last Wednesday, was one in which they expressed the deep regret with which they had received the report of the death of Mr. W. Rodger, Manager of the Bradford Road station, and their sense of the loss the department had thereby sustained.

The coke industry in the United States, considered apart from the production of coke in the manufacture of illuminating gas, is discussed, says the "Engineering Record," in an interesting census bulletin by Mr. Edward W. Parker of the United States Geological Survey. The growth of the industry is shown by the following estimates of the value of the product at different periods: 1850, $15,250; 1860, $189,800; 1870, $1,132,400; 1880, $3,359,500; 1889, $16,498,300; 1899, $35,585,400. In the figures for 1889 and 1899, the value of bye-products is included. Most of the output is used in blast-furnaces; 77·3 per cent. being so employed in 1880, and 92·3 per cent. in 1889 (the figure for 1899 is not given). The features of the industry in the last decade have been the introduction of retort or bye-products ovens, the increasing use of coke for domestic purposes, the spread of coal-washing, and the decreased cost of coal. During this period, the number of coke-making establishments has increased only 10·6 per cent., though the production has increased 96·2 per cent. in tonnage and 115·7 per cent. in value.

The formal ceremony of handing over in trust to the Mayor, Aldermen, and Burgesses of Burslem, the handsome bequest of oil and water-colour paintings, together with choice specimens of pottery, presented to the Wedgwood Institute by the late Mr. William Woodall, took place recently, in the Museum of the Institute. The Mayor (Mr. J. Bowden) presided. Mr. Corbet Woodall, who had generously undertaken to defray the expense incurred in removing, renovating, and regilding the pictures, and to provide cases for the pottery, comprised in the bequest, was unable, owing to professional engagements, to be present. Mr. Henry Woodall, however, was in attendance; and, at the request of the Mayor, formally handed over the trust. Speeches were delivered in which reference was made to the deep interest taken in Burslem and the Institute by the late Mr. Woodall; and the Mayor said he was personally very proud of the opportunity afforded him of being able to accept that gentleman's noble gift on behalf of the Corporation. It may be mentioned here that Mr. Corbet Woodall is his late brother's sole Executor.

REGISTER OF PATENTS.

Coin-Freed Gas-Meters.—Green, W. O., of Brentford. No. 10,583; June 9, 1900.

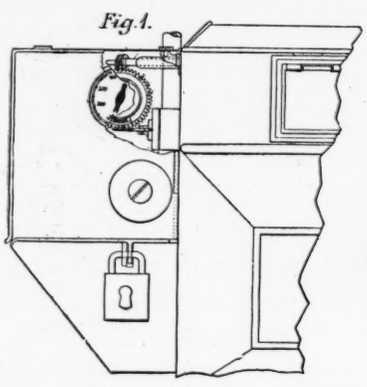
The object of this invention is to construct coin-freed mechanism for gas and other meters in such manner that: (1) The whole apparatus can be affixed to existing meters without interfering with (except in a small degree) the mechanism therein contained. (2) The inlet-valve is so constructed that leakage is absolutely prevented, and the valve positively shut off with the smallest degree of pressure. (3) All jamming of the mechanism by the coin is prevented when the mechanism is not completely operated. (4) The coin-opening is completely blocked when the requisite number of coins are inserted.

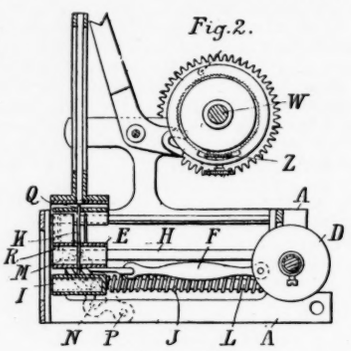
Fig. 1 shows a portion of a meter with the coin-freed mechanism apparatus applied to it; a part being broken away to show the connection between the meter-mechanism and the gas-valve.

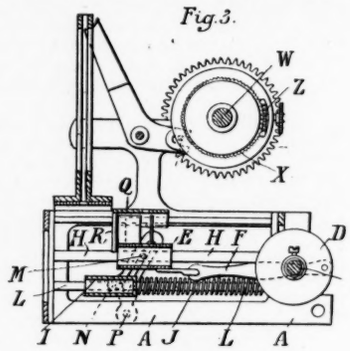
Fig. 2 is a plan and section of the coin-freed mechanism detached from the meter; showing the parts in the position they occupy with a coin inserted ready for operation.

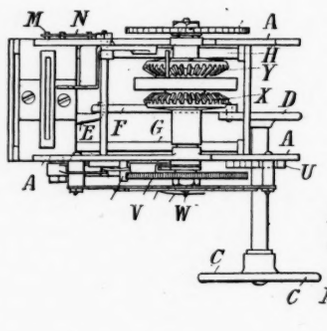
Fig. 3 is a similar view, but showing the parts in the position they occupy when the handle has been turned half its distance ready for the return movement of the coin-cradle and its appurtenances—the coin having been discharged. In this figure, the shoot blocking lever is shown as being positioned in the coin-shoot for indicating that the requisite number of coins are inserted for the full quantity of gas to be supplied for which the mechanism is adapted, Fig. 4 is a side elevation of the coin-freed mechanism and its framework, with a portion of the framework and indicating dial removed.

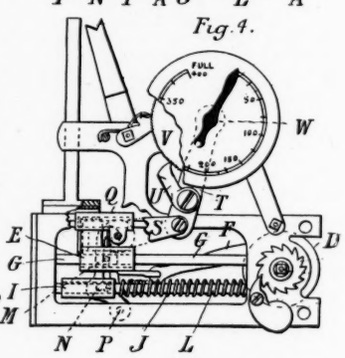
The operating-handle C carries a crank or crank disc D, in connection with the coin-cradle E, by a bar F; the cradle having a movement











along two or more rods G H fixed to the framework, or in guides formed in the framework. Situate just underneath the coin-cradle is a platform I (controlled by a spring J for supporting the coin K in its cradle) moved in the same direction as the cradle upon two other rods L or guides (only one being shown), by means of a projecting pin M engaging a slotted quadrant N. The platform is moved at a slower speed than the cradle, by reason of this projecting pin engaging the quadrant at a point nearer the quadrant fulcrum P. By this means, the coin is caused to travel along the platform I; and when the cradle E has arrived at about its full distance, the coin will have left the platform and dropped into the till underneath.

Above the cradle E is a slotted plate Q, carrying a depending pin R, which engages the back of the cradle; and on the insertion of a coin into the shoot, the coin resting upon the platform will be in position for engaging the cradle and the slotted plate Q, so that, on the operation of the handle C, the cradle and the slotted plate will move as one—the platform I moving at a lesser speed, as before explained.

The slotted plate Q has a rack, rod, or other appliance—preferably a lever S—pivoted to it, and connected, by a link T carrying a pawl U, to the axle W of a ratchet-wheel V, for moving same round the desired distance on the return motion of the slotted plate Q under the action of the spring-controlled plate I; the cradle E engaging the pin R for moving the slotted plate back. This axle W also carries a bevel-wheel X, which is in connection with another bevel-wheel Y through the intermediation of a bevel-pinion Z, which is carried by a wheel or projection-frame or pin centred on the axle W. The second bevel-wheel Y carries by its axle a toothed wheel for gearing with a worm on a rod, in connection with the index-operating rod of the meter mechanism (not shown); and the bevel-pinion carrier has a projecting flange or pin which, when the desired number of coins are inserted, actuates a balanced lever for putting one end of it into the coin-shoot, and so blocking the passage against any more coins being inserted. The axle of the bevel-pinion Z also carries a small toothed wheel; and this, as it arrives at a position for shutting off the supply of gas, comes into contact with a toothed quadrant attached to a lever carrying a pivoted plug or plate, and engages the teeth of same. By the rotation given to the bevel-pinion Z through the meter-operated bevel-wheel Y, it rides upon the toothed quadrant, and by the plug or plate presses the diaphragm easily and firmly against the valve edge or facing, and positively shuts off the gas supply. The action is gradual, and gives the consumer ample time to start a fresh supply, by reason of the lights being gradually lowered.

Supposing a coin to have been inserted in the meter, it will take a position in the cradle E and plate Q, and rest upon the platform I. The handle is now operated, and the cradle E, plate Q, and platform I are moved along as before explained—the cradle moving at a greater speed, to carry the coin over the platform for releasing the coin, while the pawl U rides over the ratchet-wheel V ready for operation. The handle is now returned; the springs J carrying the cradle back, and also the slotted plane, so that the pawl U engages the wheel V and revolves it, and also the bevel-wheel X. This acts upon the bevel-pinion Z and revolves it, and also moves the small wheel around and away from the quadrant rack the predetermined distance—say, one-sixth of a revolution—so that the spring-controlled plug can be released and push away the diaphragm, in order to open the gas-valve to allow the entry of gas into the meter.

This operation goes on for each coin inserted; the small wheel being revolved for the toothed wheel to be taken farther away from the quadrant for each coin put in. When the last, or sixth coin is inserted, the pin will engage the lever, and cause its nose to enter the slot of the coin-shoot, and so block the entrance to prevent more coins being inserted.

The gas-meter mechanism now starts operation; and by actuating the rod and worm, the wheel is revolved. This also turns the wheel Y, and actuates the pinion Z so that it is revolved and at the same time moved round in a reverse direction to that during the gas-valve opening movement—the pinion walking over the wheel X. This movement of the pinion Z is towards the gas-valve; and when it and the wheel have been moved nearly round by the meter mechanism, the gas is shut down.

The slotted plate Q will not be engaged unless a predetermined coin be inserted. Consequently, if the handle C be turned, the cradle E and platform I can be operated to eject any smaller coin placed in the coin-slot into the till. But by reason of the slotted plate not being moved with the cradle and platform, the gas-valve mechanism will not be operated. Thus the appliance can be fitted to any ordinary meter; all that is necessary being the attachment of the valve to the side of the meter, and then the fixing of the worm gear between the main index-rod of the meter mechanism and the toothed wheel connected with the second bevel-wheel—the casing of the coin-freed mechanism being secured to the meter-casing by any suitable means.

Coin-Freed Gas-Meters.—Green, W. O., of Brentford. No. 10,647; June 11, 1900.

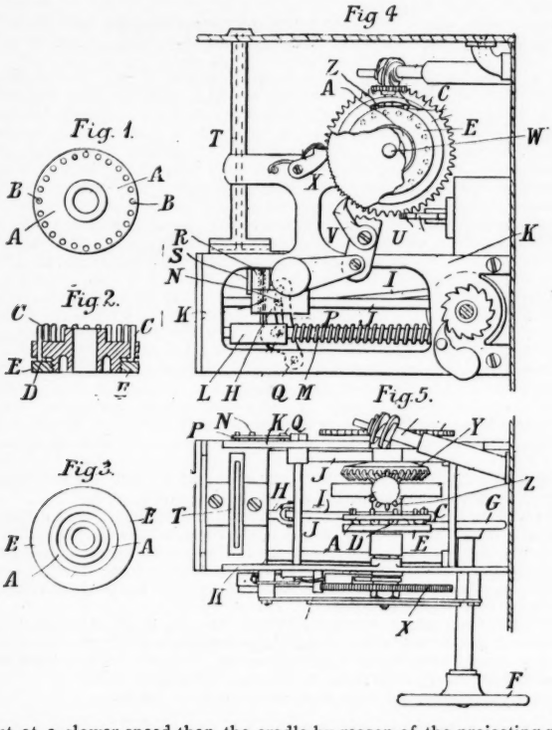
The patentee's object is to provide an appliance consisting of a holed plate for containing pins or stubs secured to it, for the purpose of acting as teeth of a wheel, and being removable in any desired manner to operate the mechanism for delivering the required quantity of gas in exchange for a coin inserted.

Fig. 1 (p. 100) is a view of the appliance capable of being altered to suit the required amount of gas to be delivered for the coin inserted; fig. 2 is a section; and fig. 3 is a back view. Fig. 4 is a sectional elevation and plan of the coin-freed mechanism.

The wheel or disc A is affixable to the spindle of the operating handle or any other part of the mechanism, and is provided with holes B or slots through which headed pins or stubs C are passed to form teeth; the heads D of the pins or stubs being securely fixed against the wheel or disc by a screw-collar E. The pins or stubs (gearing with a cog-wheel connected with the mechanism) are removable. Supposing the ring contained 50 holes for 50 pins, which would represent 50 cubic feet of gas, each tooth would operate the mechanism sufficiently to supply 1 cubic foot of gas; and one complete revolution of the ring would operate to supply 50 cubic feet of gas. But by removing 25 of the pins, only 25 cubic feet of gas would be supplied; the portion of the ring from which the pins were removed not actuating the mechanism. Thus the desired number of teeth are only left projecting from the disc or wheel to suit the amount of gas to be delivered for each revolution of the disc.

This pinned wheel or disc may be applied to any coin-freed mechanism; but for the purpose of illustrating the invention, the patentee shows a coin-freed mechanism in fig. 4, in which the operating handle F carries a crank or crank-disc G, in connection with the coin-cradle H by a bar I. The coin-cradle has a movement along two or more rods J affixed to the framework K, or in guides formed in the framework. Situate just underneath the coin-cradle is a spring-controlled platform L for supporting the coin in its cradle, and moved in the same direction as the cradle upon two other rods or guides M by means of a projecting pin N on the cradle engaging a slotted quadrant P pivoted to the framework. The platform L has a projecting pin, which engages the quadrant for it to move the platform,

Fig 4



but at a slower speed than the cradle by reason of the projecting pin engaging the quadrant at a point nearer the quadrant's fulcrum Q than the pin N. By this means, the coin is caused to travel along the platform; and when the cradle has arrived at about its full distance, the coin will have left the platform and dropped into the till arranged underneath. Situate above the cradle is a slotted plate R carrying a depending pin S, which engages the back of the cradle; and on the insertion of the coin into the shoot T, the coin will fall in the slots of the plate and cradle and rest upon the platform, and will then be in position for engaging the cradle and the slotted plate, so that, on the operation of the handle, the cradle and the slotted plate will move as one—the platform moving at a slower speed, as explained.

The slotted plate R has pivoted to it a lever connected by a link U (carrying a pawl V) to the axle W of the ratchet-wheel X, so that when the plate is moved on its outward journey, the pawl V will ride over the teeth of the ratchet-wheel X, but not operate it. On the return journey of the plate, however, the pawl V will engage the ratchet-wheel X and carry it round the desired distance—the return motion of the slotted plate being under the action of the spring-controlled platform L. This axle W also carries the plate or disc A in communication with a bevel-wheel Y through the intermediation of a bevel-pinion Z, which is carried by, or pivoted in, a disc or projection-frame or pin centred on the axle of the bevel-wheel Y; the axle also carrying a toothed wheel for gearing with a worm on a rod in connection with the index-operating rod of the meter mechanism.

The axle of the bevel-pinion Z also carries a small toothed wheel; and this, as it arrives at a position for shutting off the supply of gas, comes into contact with a toothed quadrant attached to a lever carrying a pivoted plug or plate, and engages the teeth of same, and, by the rotation given to the bevel-pinion through the meter-operated bevel-wheel, rides upon the toothed quadrant and, assisted by the movement of the disc, presses the plug or plate easily and firmly against the valve edge or facing, and positively shuts off the gas supply.

The plate or disc A and bevel-wheel Y have a motion independent of each other, so that the operation of the ratchet-wheel X by the return action of the cradle will cause the pawl V to move the plate round; and the plate will, by the action on the bevel-pinion Z, cause it to rotate the desired distance, and at the same time have sufficient movement away from the gas-valve and lever to allow the gas-valve to open—the bevel-pinion at this time walking over the bevel-wheel by reason of being held stationary through its connection with the meter mechanism. The gas now passing through the meter operates the meter mechanism; and this, acting upon the bevel-wheel in a reverse direction, causes the bevel-pinion to revolve, and at the same time to walk over the plate or disc A, and towards the valve. Thus its toothed wheel comes in gear with the toothed quadrant, and shuts off the supply of gas.

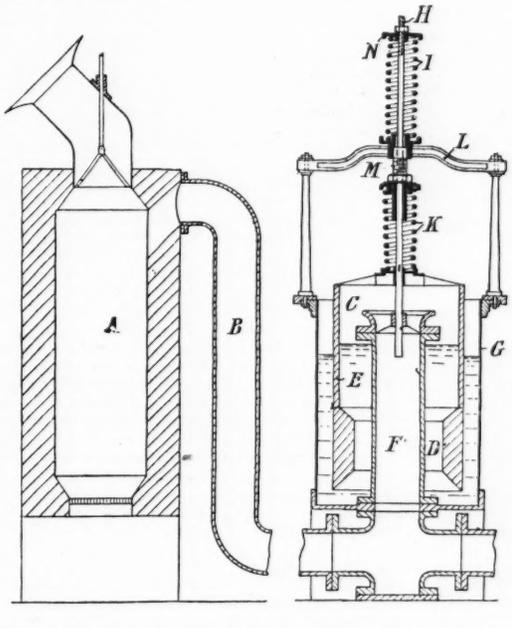
A pawl engages the ratchet to prevent any return motion; and a weighted pawl engages a ratchet-wheel on the operating-handle spindle to ensure rotation only in one direction. Thus it will be seen that, on the rotation of the disc A in one direction, the bevel-pinion Z will only be moved a distance corresponding to the number of teeth engaged with such bevel-wheel; and, in consequence, the gas-valve will only be opened accordingly—the gas-meter mechanism operating the bevel-wheel Y to actuate the bevel-pinion Z to close the gas-valve.

Pressure Regulating Apparatus.—Gerdes, H., of Berlin. No. 13,204; July 21, 1900.

This invention relates to pressure-regulating apparatus for use in connection with plant for generating explosive gas adapted to be employed with gas-engines; the object being "to construct a device in such a manner as to be operated by suction from the engine, and thus always produce only the amount of gas momentarily required for consumption."

Heretofore, in order to provide for a uniform gas generation, a device, consisting of a bell dipping into water, and suitably counterpoised, has been arranged in the conduit between the generator and the engine. This kind of pressure-regulator has, however, been found to be inefficient (says the patentee), owing to the fuel for the generator not being always evenly distributed, and to the accumulation of cinders after prolonged use, whereby the pressure upon the air or gas current is varied. This defect is still further increased by an accumulation of dust in the gas-clearing apparatus, which renders the passage of the gas more difficult.

This "improved" regulator is so arranged that the buoyancy of the bell is varied according to the varying resistance, by being provided with two floats of different sizes—the larger one constantly below water-level, and therefore always developing the same buoyancy, while the smaller float projects far above the water; so that, as the bell meets with greater resistance, the small float is further immersed in the water, and thereby increases the tendency of the bell to rise. As a modification, the bell may be fitted with a submerged air-container, the air pressure in which may be varied according to its power of buoyancy or tendency to lift the bell.



The generator A in the engraving communicates with a gas-engine (not shown) by means of a pipe B. From here a tube F ascends into the bell C, arranged in a water-tank G; the bell being controlled by a bar H guided in a strap L. The bell is provided with two floats—a large lower float D, which is constantly submerged, even in the highest position of the bell, and therefore has a uniform lifting-power or buoyancy, and a small float E arranged above the larger float, and projecting far out of the water. This latter float is for the purpose of increasing the lifting power when the bell is in a lower position.

For example, if the large float has a uniform lifting power corresponding to the suction power of a water column of 40 mm., as may be required for normal working of the plant, and if the pressure rises to 60 mm., owing to the accumulation of clinkers in the generator or to a blockage in the gas-scrubbers, this increase in pressure will cause the bell C to move into a correspondingly lower position, in which the float E increases the lifting power to an equal amount of 20 mm.

In order to regulate the suction effect of the bell C as may be required, the guide-bars H of the bell are furnished with two springs I and K—one bearing against the guide-strap L, and also against an adjustably-arranged stop N upon the guide-bar H; and the other spring K bearing on the bell C, and against an adjustable stop M on the guide-strap L. When it is desired to increase the suction effect (in order to supply several gas-motors from the same generator), the upper spring I is strained more, releasing the lower spring K to a corresponding extent. The two springs also aid in deadening the shocks produced by the abrupt up-and-down motion of the bell.

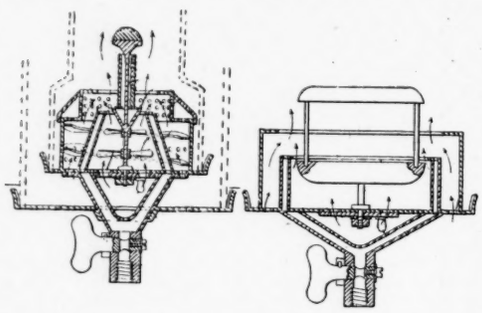
Automatically Turning Gas On and Off at Predetermined Times.—Sigurdsson, O. V., of Ravenscourt Park, W. No. 13,528; July 27, 1900.

To automatically turn gas on and off at predetermined times (at intervals of more or less than twelve hours between each action), the patentee proposes to employ a main gas-pipe fitted with a tap, and provided with a bye-pass; also clockwork apparatus to retain and liberate at the required times an arm fixed on the gas-tap plug (which latter is acted upon by a spring). The clockwork employed may go

either for a day or a week; but in either event there is added a spindle having on one end a toothed wheel driven by a pinion receiving motion from the hour-wheel, and of such proportion as to give to the toothed wheel one complete revolution in 24 hours. On the other end of the additional spindle, there is a disc provided with a number of notches on its edge, of such number (48) as to serve for half-hour setting, or (96) to serve for quarter-hour setting. On the extra spindle close to the notched disc are also arranged two or four loosely-mounted spring arms, each provided with a pin or projection capable of being placed in one or other of the notches and with a cam. In connection with the clockwork is a plate on which are mounted two (or it may be four) double-ended detent levers, acted upon by springs; one end of each lever being in such a position as to be acted upon by one of the cams, while the other, or detent, end projects through the plate in a position to stop the arm of the gas-tap from rotating until, when the predetermined time has arrived, the cam acting on the detent lever, causes the detent end to descend out of the way of the gas-tap arm, and thereby allow the latter to pass to another detent lever where it will be detained until another period has passed, when it is again liberated as described.

Gas-Burners.—Bennett, F. M., and Fowler, J. O., of New York. No. 1703; Jan. 24, 1901.

This invention relates to an apparatus for burning illuminating gas or vapour, of the regenerative type—"broadly stated as an improvement upon the so-called argand burner;" and it has for its object the provision of an appliance designed to burn the vapour of bodies rich in carbon and hydrogen, or gas from carbonaceous deposits (such as oil, coal, or petroleum), mixed with the proper quantity of air, for the production of light or heat. The device may be utilized for the generation of heat, with or without light—*i.e.*, with either a blue or white flame, according to the quantity of air admitted—and also to produce light, either as a result of combustion or incandescence, or both.



Referring in general terms to the two forms of burners shown, the patentees say that the admission of the air to the gas is so adjusted that, in the mixture obtained, the amounts of oxygen and hydrogen are practically in the proportions of the chemical equivalents of these two gases. The mixed air and gas issues from the burner under greater pressure than that furnished by the normal pressure of the gas-distributing system, and with greater speed than that with which the gas would ordinarily pass through the burner. Within the preferably circular flame of the burner, and also adjacent to the same, there is a zone of superior incandescence formed (a hyperincandescent zone), which is very much more intense, and also somewhat hotter, than the ordinary flame. In the burner they ordinarily place refractory material close to the hyperincandescent zone, so that it will be in direct contact with the highly heated air and the products of combustion rising from the flame. The refractory material thus becomes hyperincandescent, and furnishes with the same consumption of gas a more intense light, or with a less consumption the same amount of light given by other burners.

In the burner, the air and gas are first heated separately, in proper proportions and to the proper degrees, and then the column of flame is treated with air, thrown against it both from within and without, "whereby complete combustion is secured, and a light of great whiteness and intense brilliancy is obtained."

APPLICATIONS FOR LETTERS PATENT.

12,792.—Appleyard, F., "Incandescent gas-burners and chimneys." June 24.
12,837.—Crastin, C., "Carburettor." June 24.
12,858.—Made, P. R., van der, "Carburettor." June 24.
12,887.—Herring, W. R., "Gas-producers." June 25.
12,895.—Smith, J. B., and Wincott, G. P., "Gas-producers." June 25.
12,913.—Mills, B. J. B., "Carburettors." A communication from the Pan-American Motor Company. June 25.
12,930.—Seck, W., "Gasifier for driving gas-engines." June 25.
12,934.—Bernson, C. W., "Gas-burners." June 25.
12,940.—M'Clurg, W. J., "Gas-generators." June 25.
12,956.—Trocquenet, C. L. J., "Incandescent gas-burners." June 25.
12,959.—Merrifield, L. L., and Checkley, E. J., "Producing gas from peat." June 25.
12,972.—Blanitza, L. F. de, and Herard, J., "Manufacture of gas." June 25.
12,994.—White, J. W., and Forster, J. S., "Conveyors for transporting coal or other materials." June 26.
13,047.—Koppers, H., "Treating gas water." June 26.
13,062.—Perry-Keene, L. H. A., and Statter, J. G., "Burners." June 27.
13,096.—Kew, H. E., "Gas-retort fastenings." June 27.
13,129.—Hutchings, J., "Gas-engines." June 27.
13,191.—Chamberlain, J., "Obtaining light from gases of low calorific value." June 28.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by correspondents.*]

Gas v. Electricity in Rosario de Santa Fé.

Sir,—I have been greatly interested in various papers and reports which I have read in the "Journal" and elsewhere on the above subjects; and while I am perfectly satisfied that gas is a far cheaper illuminant than electricity in candle power, I am of opinion that the arrangement of the lights in the streets, shops, and houses is not attended to as it should be.

In Rosario, where the streets are not very wide (the average is 36 feet), I conceived the idea of making a long, light bracket, composed of 1-inch gas-tube, and light wrought-iron scroll work, on which to hang globe lamps containing two incandescent lights, of 60-candle power each, in the centre of the streets. The public lighting was then done by electric arc lamps. The Municipality gave us a trial, and the light proved to be so effective and economical, that soon afterwards the order was given to illuminate the whole length of the principal street—the Calle Cordoba—with the same lamps. Truly beautiful and very effective lighting was the result; and I may say that, according to experts, they have not seen anything like it in any part of the world. The brackets, which are light and elegant, are shown in the photographs which I enclose.* They are completely out of the way of horse or passenger traffic, and in the daytime look quite neat in their coat of green and bronze paint.

I have arranged a small bye-pass cock enclosed in a wall-box, from which there is a small tube connected with the pilot-lights in the lamp, and which can be turned off or on by the lamplighters without any climbing. For cleaning the globes and changing the mantles, we send a man in a light cart, fitted with a folding ladder, to go round periodically; and we have also arranged a method of sliding the globe downwards, and hanging it by clips until the work is accomplished.

We have fitted a good many large stores with quadruple lamps, and several restaurants and hotels have placed orders with us for the same; and I may add that they will be unanimously adopted. We have just received further orders for street lighting; and the fitful, ghastly electric arc lamps are disappearing from the streets of Rosario.

In writing this letter to you, I have been actuated by a true interest in gas lighting, and by a letter which appeared in the "Journal" for the 23rd of April last (p. 1070), entitled "Our Lamps are Gone Out." In Rosario electric light lamps are removed to make room for gas, and not the opposite, as the writer of that letter says is happening in other places. The present, and old, system of using short side brackets or stunted, inconvenient, cast-iron pillars for carrying funereal-looking square or hexagonal lamps, usually lop-sided or out of perpendicular, ought to be relegated to things of the past. The height of the lamps is 16 feet from the pavement to the bottom of the glass globe.

I trust the foregoing may be of interest to your readers.

Rosario Gas Company, June 6, 1901. Robert G. Shaw, Engineer.

* Unfortunately, the photographs reached us in too faded a condition to allow of reproduction. They can be inspected by anyone specially interested in the matter about which our correspondent writes.—Ed. J.G.L.

Cost of the Kitson Light at Ripon.

Sir,—As the question of intense lighting is now an important one to all gas managers, I send a statement of the cost of working the Kitson incandescent oil-lamps, which are now standing so prominently before the lighting world. The Ripon Corporation have had the Market Square illuminated by four of these lamps for three years, and the light is all that can be desired. It is equal to 1000 candles, and is self-contained—needing no opening of the streets for cables or pipes. During the past lighting season, the lamps were on for 2426 hours, and the cost of oil, gauzes, mantles, &c., was £24 13s. 8d.; and the proportion of the lamplighter's time £4 3s. 4d.; making a total of £28 17s., or £7 4s. 3d. per lamp, being equal to 0·713d. per hour for 1000 candles, or 0·0007d. per candle per hour.

Ripon, July 1, 1901. E. E. J. Anderson.

Mr. Carpenter's Notes on Purification.

Sir,—I have just been reading Mr. Carpenter's "Further Notes on Purification of Gas" in last Tuesday's "Journal," and I should like to ask him if he considers a 1½-inch tar seal in the hydraulic main the most suitable to employ. Further, he says "the gas and tar should not be separated before they reach the condensers." These two statements I venture to say are rather misleading to students, as surely they do not represent modern practice. Would not any advantages accruing from contact of the gas with the tar be more than counterbalanced by the disadvantages?

East Ham, July 4, 1901. A. V. Hendrickson.

Welsbach's Belgian Patents.

Sir,—In an article in your issue of June 25, headed "Invalidity of the Belgian Welsbach Patents," you state, in effect, that the action in the Brussels Court to obtain a declaration of the invalidity of the Belgian Welsbach patent (corresponding to the English, 1893, Welsbach patent) had succeeded. We must ask you kindly to at once give a contradiction to this statement, which is untrue, as you will see from the following explanation.

An action (the judgment in which you quote) was brought with the object of declaring the patent invalid; but herein such action failed, as the validity of the patent was upheld by the Court. At the same time, however, it was decided that the patent was what is called by Belgian law an "improvement patent," whose duration was liable to determine at the same time as the Belgian 1885 and 1886 patents.

We need hardly point out that this state of things does not prevail under the English patent law; and the only bearing of this action, if it has any bearing at all, upon the litigation pending here on the 1893 patent, is to set out the fact that the Belgian Courts consider the corresponding Belgian patent a good and valid one. FAITHFULL AND OWEN.
Victoria Street, S.W., July 8, 1901.

[We insert, for what it is worth, the above letter from the Solicitors to the Welsbach Company—though why we should be called upon to occupy "JOURNAL" space with it, is not apparent. In the first place, it should be remarked that it was not an "article" to which our correspondents call attention; but, as clearly stated, a report of proceedings which took place in the Belgian Court of First Instance. No assertion was made that the case as determined at Brussels had "any bearing at all" upon the litigation pending in England over the 1893 patent. Whether the statements contained in our report of the judgment are "untrue," and therefore require "contradiction," will be apparent if readers will turn to the last paragraph of the judgment (p. 1758), where it is said that the Court declared that the Belgian patent of Dec. 31, 1892 [corresponding to the Welsbach English patent of 1893], was wrongly qualified as an invention. To emphasize their judgment, the Court condemned the defendant Companies to pay the cost of the proceedings. It had previously been stated in the "JOURNAL" that the Companies had lodged an appeal against this decision; but from all accounts, they are not likely to secure a reversal of the judgment.—ED. J.G.L.]

PARLIAMENTARY INTELLIGENCE.

GLEANINGS FROM THE COMMITTEE ROOMS.

The Situation. There was very little moving, of a noticeable character, in the Committee rooms last week. The Lords Committee in whose group the South Metropolitan Gas Bill appears did not get far with their work, having only commenced their sittings on Thursday. The Bill is placed rather low in the list, and there are some ponderous looking measures before it; so that there is just the chance that another week may pass before the Bill enters upon the final journey which will decide its fate. The life or death of the Mond scheme rests in the hands of Lord Hatherton's Committee; but they, too, have a fair amount of work to get through before they reach that colossal project. A Bill which has a prior place is that of the Golborne Gas Company, against which the Leigh Corporation have lodged a petition. This seems rather a curious proceeding, seeing that in May the Council determined not to oppose the Bill in its further stages through Parliament. The Newport (Isle of Wight) Gas Bill will come before a Committee of the Commons in the course of a few days. When it was before the Lords, the opposition was withdrawn, so that it did not have to go through the mill on that occasion. A Commons Committee began the consideration of the Barrow-in-Furness Corporation Water Bill at the end of the week. It has already been through the Lords.

Electrolysis—A Case Prejudged. The hope we all cherished that this session would yield to gas and water companies proper defence in the matter of electrolysis is not likely now to be realized. Excepting in the Sheffield case, the companies' plea has fallen all along the line; and they have received little encouragement from Committees to persevere in their endeavour. In less than ten days after the brave but abortive fight the Metropolitan Water Companies made on the London United Tramways Bill, the Bexhill Bill came before a Committee of the Upper House, presided over by Lord Clonbrock; and the South Metropolitan Gas Company and the Kent Water Company appeared, as they did in the Lower House, with a petition for greater protection than the Bill at present accords them. Counsel opened the case for the Bill; but even before he had arrived at the end of his speech, the Committee clearly gave the Companies to understand that they would not receive any favourable consideration at their hands. In consequence of this intimation, Counsel for the petitioners withdrew. The action of the Committee is not exactly what an Englishman calls fair play. The Companies had gone to some trouble and expense in fortifying their case for the occasion; and they ought certainly to have been heard. But the time will come when they must be heard; and day by day they will be able to strengthen their already strong claim to better consideration than they have had this year. This is a case in which deferred hope must not be allowed to make the heart sick; and no opportunity should be lost by gas and water suppliers in making their voices heard on the subject. The paper on electrolysis which Dr. Leybold will read before the Gas Section of the Glasgow Engineering Congress may produce some supporting material.

Finality in Withdrawing Opposition. A point has been raised over the Bingley District Council Bill (which has for its purposes certain town improvements and the purchase of the Cullingworth Gas-Works) which it may be well to note for the edification of local bodies. The question is this: When a parliamentary committee of a local authority have consented to the withdrawal of opposition on certain terms which the promoters have complied with, shall the local authority have the right of subsequently saying they are not bound by the consent because another committee disagree with the acquiescing parliamentary committee, and then follow this up by offering further opposition to the measure? Fair-minded people will only find one answer for this question; and there must surely be some finality in these matters. But the Bradford Corporation apparently think otherwise. The Bingley Bill was strongly opposed when before the Commons, mainly on points which did not concern us; but all the opposition was satisfied. When the Bill came before the Lords, the Bradford Corporation lodged a petition, and were in fact the only opponents. But it was questionable, with a knowledge of the circumstances, whether the Corporation had not forfeited their right to be heard in opposition. Bradford possesses water-works and other property in the district administered by the Bingley authority; and a question arose as to the rating of this property. There was some correspondence on the subject, which resulted in the promoters offering the insertion of a protective clause. On March 30 the Town Clerk wrote that the Corporation Parliamentary Committee had considered the offer; that, under all the circumstances, they were willing to accept it; and that, subject to the clause being satisfactory, their active opposition would cease. The clause was duly inserted in the Bill; and a copy forwarded to the Corporation. In the meantime, the Water Committee dissented from the action of the Parliamentary Committee; and on April 27 the Town Clerk informed the Bingley Council that he was instructed to oppose the Bill, as the "Parliamentary Committee" did not deem the clause submitted satisfactory. Following this, a petition was lodged against the Bingley Bill; the Corporation asking that they should be rated for all their property at only one-fourth the annual value. This was the position when the Bill came last week before a Committee of the House of Lords. Counsel for the promoters very properly argued that, as the Corporation were now going back on their agreement, and as the Bill referred only to improvements and to the gas-works purchase, the Corporation had no *locus standi* in seeking to secure exemption from the existing system of rating. With this view, their Lordships agreed; and the Bill will now proceed as an unopposed measure.

HOUSE OF LORDS.

The following further progress has been made with Bills:—

Bills brought from the Commons, read a first time, and referred to the Examiners: Biggleswade Water Board Bill, Shipley Improvement Bill.

Bills read a second time: Rhyl Improvement Bill, Shipley Improvement Bill.

Bill reported: Burgess Hill Water Bill.

Bills reported, with amendments: Aldeburgh Corporation Water Bill, Aldershot Gas and Water Bill, Bingley Urban District Council Bill, Bury Corporation Bill, Long Eaton Gas Bill, Swanage Gas and Water Bill, Winsford Urban District (Gas Transfer, &c.) Bill.

Bills read the third time and passed: Burgess Hill Water Bill, Dorking Gas Bill, Dover Gas Bill, Llandrindod Wells Urban District Council Water Bill, Local Government Provisional Order (Gas) Bill, Mansfield Corporation Bill, Stroud Gas Bill, Tees Valley Water Board Bill.

Bills Royal Assented: Ardrossan Gas and Water Order Confirmation Bill, Alfreton Gas Bill, Aspatria, Silloth, and District Water Bill, Bath Gaslight and Coke Bill, British Gaslight Company Bill, Chester Gas Bill, Grangemouth Water Provisional Order Confirmation Bill, Gravesend Gas Bill, Hamilton Burgh Provisional Order Confirmation Bill, Honley Urban District Council Gas Bill, Horley District Gas Bill, Leatherhead Gas Bill, Local Government Provisional Order (Gas) Bill, Newcastle-upon-Tyne and Gateshead Gas Bill, New Swindon Gas Bill, Oakham Water Bill, Omagh Gas Bill, Otley Gas Bill, Paisley Gas Provisional Order Bill, Shrewsbury Gas Bill, Sutton-in-Ashfield Urban District (Water) Bill, West Surrey Water Bill.

A Bill to confirm a Provisional Order under the Private Legislature Procedure (Scotland) Act, 1899, relating to Edinburgh and District Water, was presented last Friday, read the first time, deemed to have been read a second time, and reported from the Committee.

Lord Crofton has replaced the Marquis of Winchester on the Select Committee considering the group of Bills containing the Golborne Gas Bill, the Mond Gas Bill, and the Wallasey Improvement Bill.

HOUSE OF COMMONS.

The following further progress has been made with Bills:—

Bill brought from the Lords, read the first time, and referred to the Examiners: Dover Gas Bill.

Lords Bills read a second time and committed: Elland Gas Bill, Gas and Water Orders Confirmation Bill, Harpenden District Gas Bill, Harrogate Water Bill, Newport (Isle of Wight) Gas Bill, Ripon Corporation Bill, Smethwick Corporation Bill, Stratton and Bude Improvement Bill.

Bills reported, with amendments: Derby Corporation Bill, Handsworth Urban District Council Bill [Lords].

Bills read the third time and passed: Biggleswade Water Board Bill, Chester Gas Bill [Lords], Poulton-le-Fylde Gas Bill [Lords], Prestatyn Water Bill [Lords], Shipley Improvement Bill.

The Newport (Isle of Wight) Gas Bill [Lords] has been referred to a Select Committee, consisting of Sir F. Godson (Chairman), Mr. E. J. C. Morton, Mr. Guest, and Mr. J. A. Dewar; to meet next Thursday.

Petitions against the Harrogate and Leeds Corporation Water Bills have been presented by the West Riding of Yorkshire Rivers Board, and by the West Riding County Council; against the former Bill by the Leeds Corporation; against the latter, by the Ripon Corporation; and against the Stockport Corporation Water Bill, by the Hayfield Rural District Council.

The Lord Mayor of Manchester (Right Hon. Thomas Briggs) visited Longdendale last Thursday, with the Water-Works Committee, and performed the ceremony of inaugurating some new settling-pools.

An advance of wages having been granted by the employers of gas-fitters in Belfast, Mr. Stelfox has been authorized to make similar concessions to those in the service of the Corporation Gas Department.

HOUSE OF COMMONS COMMITTEE.

Friday, June 21.

(*Before Sir* JOHN KENNAWAY, *Chairman, Mr.* J. H. ROBERTS, *Mr.* HELME, *and Mr.* SPEAR.)

LONDON UNITED TRAMWAYS BILL—ELECTROLYSIS OF GAS AND WATER MAINS.

(*Continued from p.* 39.)

At the close of the evidence tendered by the promoters of the above-named Bill, as reported last week,

Mr. BAGGALLAY opened the case for the petitioners, and proceeded to call the following witnesses.

Professor *W. E. Ayrton* said he was of opinion that the recommendation of the Joint Committee of 1893 to the Board of Trade had not been carried into effect by the Board. It was: "That a return conductor, if in contact with the ground, shall be of such section and resistance as to have no difference of potential sufficient to set up injurious leakage currents in the earth." Nothing in the Board of Trade regulations prohibited an electric tramway or railway sending a large electric current through a gas or water pipe. The Board of Trade rules specified the maximum electric pressure a company might bring back to their dynamo by means of their own earth plates, and the electric pressure a company might produce between their rails and a pipe, and the maximum pressure the company might set up between the ends of their uninsulated rails. But nowhere was it stated that any rule was infringed if the current sent through a gas or water pipe by an electric traction company exceeded any particular voltage. The tramway promoters contended that, if these rules were complied with, it would follow, as a necessary consequence, that the current in the pipe would be small, and the electrolytic damage negligable; and they argued that no appreciable current had been detected in gas or water pipes caused by a tramway working under the Board of Trade rules. He had maintained over and over again that this was illusory. The Board of Trade regulations would prevent the destruction of pipes occurring at a rapid rate; but there was nothing in them to prevent considerable currents being sent by electric traction through pipes. In conjunction with Professor Perry, he had, since the hearing of the Bexley Bill, carried out experiments in the Clapham Road, to measure the actual currents sent into the pipes by the City and South London Railway; in the Chiswick High Road, by the London Electric Tramways; in Liverpool, by the electric tramways there; and so forth. In each case he found that these currents were much larger than the Tramway Companies were aware of. Witness described the experiments he had made in the Clapham Road. He found there that even when the traffic was slack, at 3 to 4 p.m., on the City and South London Railway the current in a pipe under test reached 10 amperes; between 5 and 6 o'clock, it reached 12 amperes; and between 6.30 and 7, the current actually went up to 14 amperes, in spite of the fact that there were in the same road various other pipes, and that the railway was enclosed in an iron tube some 50 feet below the surface of the road, and that the line was worked on what was known as the "three-wire system"—that was to say, the rails in the tube brought back an electric current equal to only the difference between the currents used to drive the trains on the up line and the trains on the down line. That was, the current on the rails was of the same magnitude as the current on the rails of a steel electric tramway. Such currents flowing at present under the streets of London were unsuspected in the hearing of the Bills before the Committee recently. One ampere, flowing continuously in a wet soil, would remove 14 lbs. of iron per year. Of course, he did not say that the current flowed continuously. The pipe in the roadway opposite No. 193, Clapham Road, was eaten away on the side nearest the generating station, which was where the current would tend to leave in order to return to the generating station. He did not say that the whole of the eating away of the pipe was produced since the line had been worked under the Board of Trade regulations.

Mr. BAGGALLAY: You found certain eating away. You cannot show absolutely that this eating away was within any given period when the Board of Trade regulations were in force; but the test showed that the current, at the time the regulations were in force, was sufficient to eat away largely?

Witness: That is exactly it. The current which was flowing on May 14 of this year was quite sufficient to produce the eating away in a comparatively short time. The condition as to the volts was certainly being fulfilled when our tests were made.

It is put forward on behalf of the promoters that there is no instance of electrolytic damage having been caused to a pipe where the tramway traction company have been working under the Board of Trade regulations. Do you concur?—No. I consider that is erroneous.

In further examination, witness said that when the Clapham pipes were produced, it was said that they had been affected before the Board of Trade regulations were applied to the line. It seemed wise, therefore, to take a town where the tram-lines had been running for only a few years; and the place selected was Liverpool. Four openings were made in the road; and current was found at each. The places corresponded more with the middle of an electric system; they were not spots where he should expect the current to enter or leave, but where he should expect to find it flowing. The next thing was to consider where damage was likely to be found; and witness and Professor Perry, who was acting with him, asked the Chief Engineer of the Gas Company to open the road in only one part of the town. This gentleman made two openings fairly close together; and in both there was distinct evidence of eating-away of the pipes. The eating-away formed a pitting—not actual corrosion of the outer surface of the pipe—pieces being picked out of the pipe. In one case, the pipe had been laid a long time, and in the other since August, 1899. In one instance, the outside of the pipe was soft (instead of being hard like iron), and could be scraped away with a knife. Electric trams had been running in the street since 1898. At some expense, the Gas Company cut out the pipe bodily; and it had been brought to the room for the Committee to inspect. [The length of pipe was produced and exhibited to the Committee; an official stating that it had been laid since 1871.] Since the hearing of the Bexley case, witness had also made some experiments in the Chiswick High Road, along which tramways were worked by the promoters. Openings were made in the road at several places; and they found that the current was at a maximum of about 6 amperes—the same practically as the current at Liverpool.

By the COMMITTEE: There would be more risk of action at a joint of a water-pipe than at a joint in a gas-pipe. The current might do harm where it left the pipe, or at a joint which electrically was a non-conductor. If the pipe was in very dry ground, and had no water inside, a bad joint would tend to stop or diminish the current very much. But if there was water in the pipe, there would be less tendency to stop the current, because the water had more conductivity.

Mr. BAGGALLAY: In the case of a gas-pipe, I take it the gas is so dry that it does not form a conductor?

Witness: That is so. In the case of a gas-pipe, if there were electrolysis it would nearly always be shown on the outside.

The actual damage is simply a question of time, in relation to the magnitude of the current?—Certainly.

If the current is passing through any part of the pipe, and leaving it at any point, electrolysis is surely going on?—Yes. It would be much greater with some kinds of soil, and less with others.

Do you know that in America a large number of tramways worked by the overhead system have insulated returns?—Yes.

Are 1½ volts necessary to produce electrolysis?—Not at all.

Is it merely a question of prolonging the time?—Certainly. It depends on the metals and the liquid with which the earth is moistened. If you have a soft solution, you may get electrolysis with the eating-away of iron when the electric pressure between two pieces of iron is far less than 1½ volts. Iron may be eaten away if it is in earth or sand moistened with saltish water—water much less salt than sea water—when the pressure between the rail and the pipe is far less than that allowed by the Board of Trade.

In further examination, witness said that a soil containing either cinders or pyrites in conjunction with iron would set up electrolytic action. If the pipe was in soil containing nothing of that kind, it would last for a very long time, unless the current was supplied from some outside source, because there would be no galvanic battery formed. Generally, natural soil would not be this sort of material. The best conditions for producing electrolysis rapidly by means of an outside current would be an iron pipe laid in soil containing a certain amount of sewage saline; because the soil would be conductive, and the salt of the iron would be dissolved easily and carried away as chloride of iron. It had been urged that if electrolysis were taking place on gas or water pipes, corresponding electrolysis would be found on the rails at the point where the current left the rails. He had been very much interested in connection with this to discover why the rails were not damaged. The explanation was this: The surface of a tramway-rail exposed was very great indeed, being some 50,000 square feet per mile of tram-line. The rails being laid comparatively uniformly—in this case with concrete, wood blocks, and granite sets the whole way—the tendency of the current to leave the rail was not very marked in one place, but was about the same over a considerable area. The result was that, even if there was a considerable current leaving the rails, the amount per square inch was very small. In the case of the Chiswick line, the amount of electrolytic damage to the 90-lb. rails was less than the ordinary wear of the running of the tramcars; and therefore it probably was quite true that there was no evident electrolytic removal of the steel from their rails. But this was absolutely no evidence whatever that a current was not leaving the rails and entering the pipes. The interesting fact which had been brought before the Committee—namely, that before electric trams started in Chiswick, large currents were said to be flowing in the rails—was brought up last year; it being maintained then by Mr. Parshall that the variation in these currents in the rails proved conclusively that they were due to other electric traction systems. If that was so, it was a very powerful argument against the use of uninsulated returns.

Cross-examined by Mr. FITZGERALD: He was not a tramway engineer, but was very familiar with the working of tramways. For the time being, the Board of Trade regulations were a fixed quantity; and they had been a fixed quantity since 1894, so far as he was aware.

Mr. FITZGERALD: The point is this—that the Board of Trade, as Sir Courtenay Boyle pointed out, are quite prepared to alter their regulations from time to time if a proper case is made out. Now you have given a great deal of interesting evidence. Have you put that evidence on previous occasions before the Board of Trade?

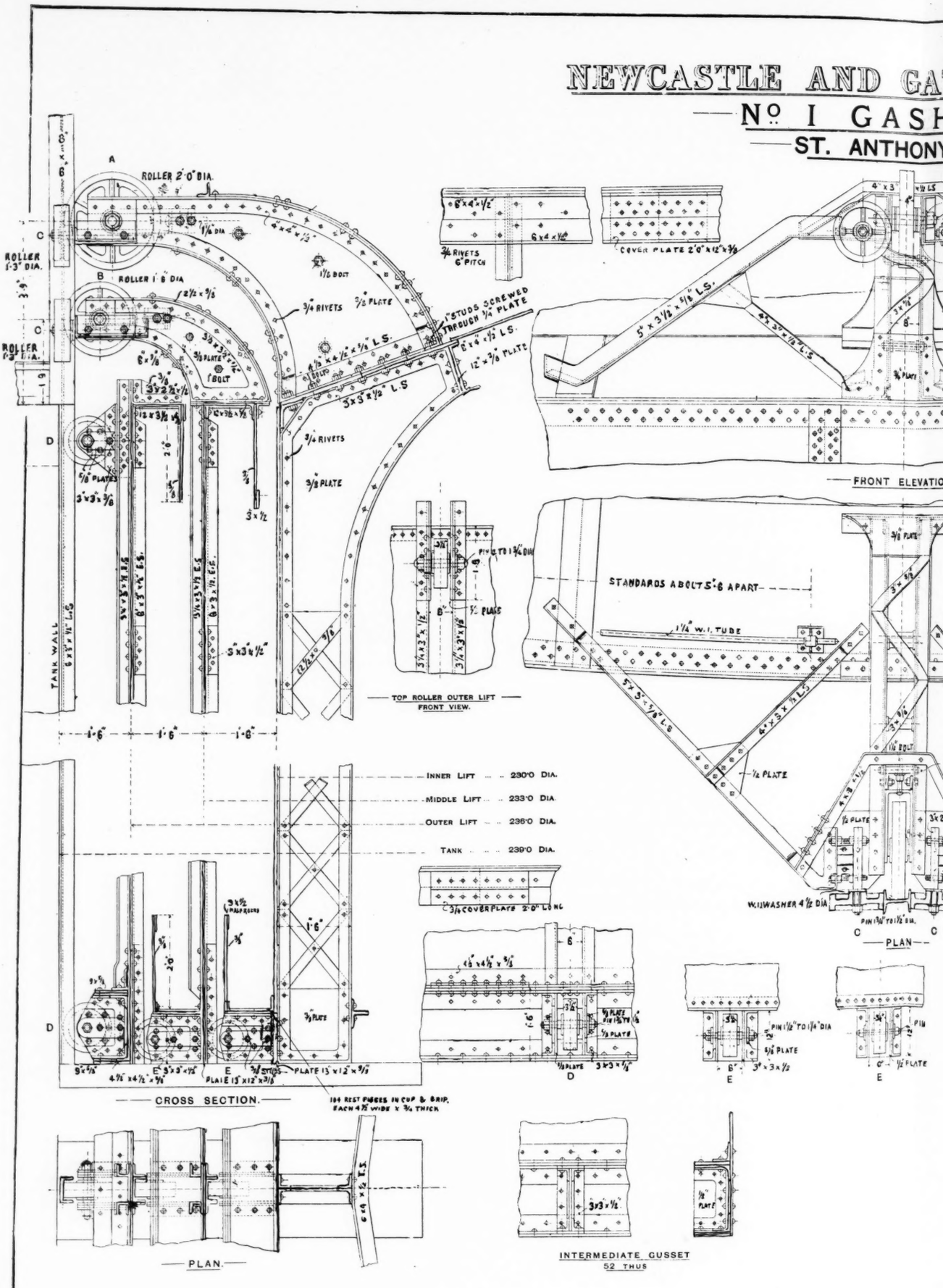
Witness: No. The last time I appeared before the Board of Trade was in connection with the Wakefield Order. After hearing the evidence, Sir Courtenay Boyle decided that he would not give any decision whatever until Parliament had decided with reference to some of these Bills on this very point of electrolysis. It was in the evening of that very day that I wrote and said it was absolutely necessary, therefore, that we should be put in possession of indisputable evidence as to whether there are or are not currents in gas and water pipes, and as to whether damage had been caused by working under the Board of Trade regulations. I have had no opportunity of putting this information before any public body before to-day.

The Water and Gas Companies this year (a very short time before the Bexley Bill was heard) did approach the Board of Trade, and ask them to alter their regulations?—They did.

If they did not avail themselves of your services then, and enable you to put whatever you had to say before the Board of Trade, that was their own fault?—They did avail themselves of my services; but I had none of this information then to put before the Board of Trade.

You think that the representations which were made to the Board of Trade on that occasion would be considerably strengthened by the information you have obtained since?—We have a great deal of information since that date.

Does it not occur to you that, as the Board of Trade are perfectly authorized to alter their regulations, and have told you they are willing to do so, whenever it has been proved to them that the regulations are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ST. ANTHONY
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1⅛ BOLT
¾ RIVETS
⅜ PLATE
1" STUDS SCREWED THROUGH ¾ PLATE
6"x4"x½" L.S.
12"x⅜" PLATE
3"x3"x½" L.S.
TANK WALL
6"x3½"x½" L.S.
3"x3"x⅜"
⅝" PLATES
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5"x3½"x⅝" L.S.
4"x3"x⅝" L.S.
FRONT ELEVATION
TOP ROLLER OUTER LIFT
FRONT VIEW.
STANDARDS ABOUT 5'-8 APART
1¼" W.I. TUBE
½ PLATE
W.I. WASHER 4½ DIA
PLAN
INNER LIFT ... 230'0 DIA.
MIDDLE LIFT ... 233'0 DIA.
OUTER LIFT ... 236'0 DIA.
TANK ... 239'0 DIA.
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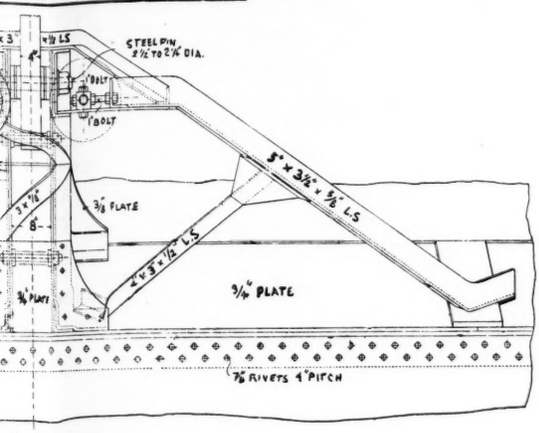

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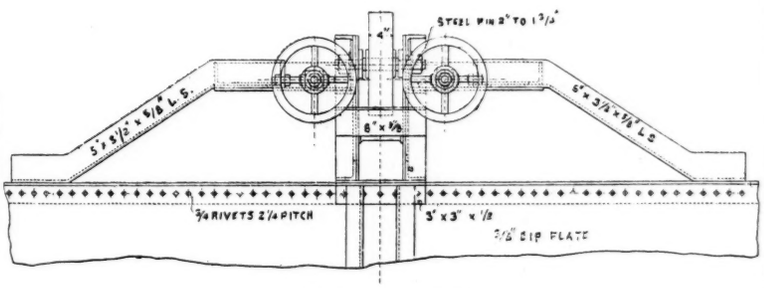

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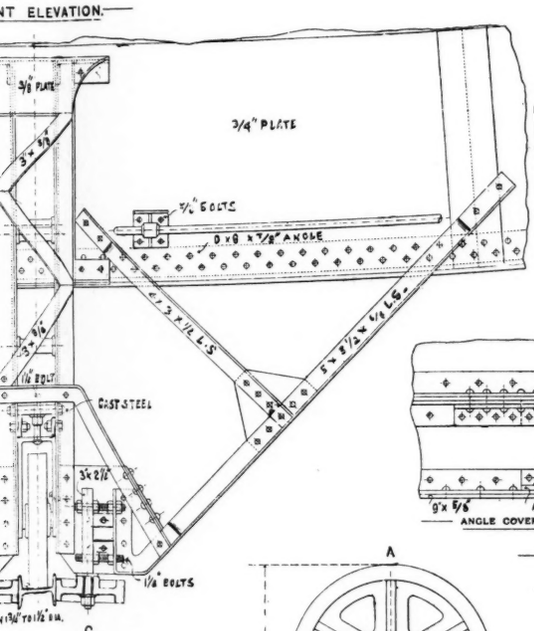

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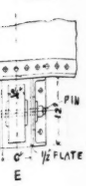

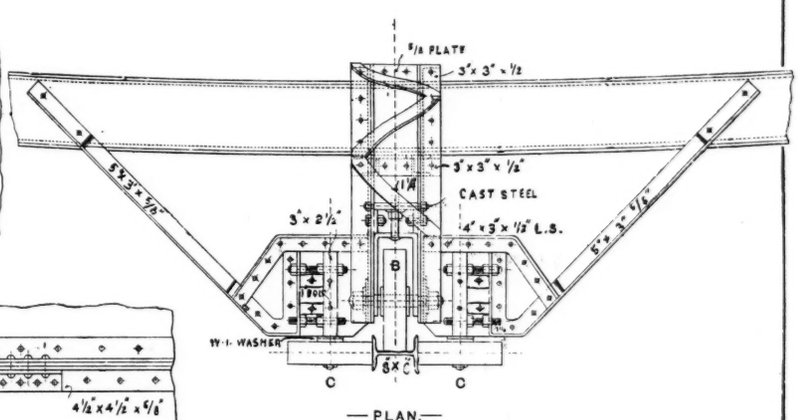

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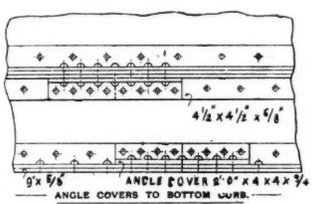
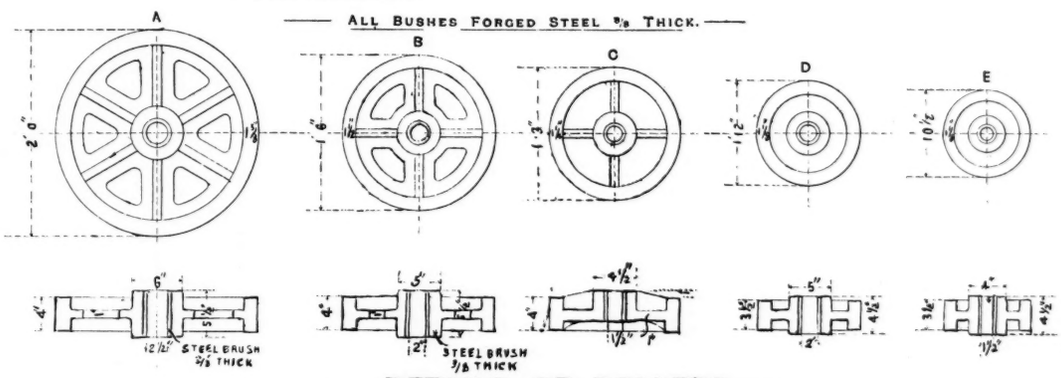


ANGLE COVERS TO BOTTOM CURB.—

— ALL BUSHES FORGED STEEL ⅝ THICK. —



— DETAILS OF ROLLERS. —

ELSWICK GAS WORKS,

Th. Fog Gas Engineer.

deficient, your proper course is to put your information before the Board of Trade?—It is not for me to say what is the proper legal course to be adopted by the Gas and Water Companies.

Supposing this Bill were to pass in the shape in which it was introduced, it does not in the least prevent the Gas and Water Companies going before the Board of Trade and asking them to alter their regulations to meet the case they think they have made out?—Certainly not.

But if the clause is inserted in the Bill which the Water Companies are asking for, it would decide the question entirely in your favour?—I do not quite follow you.

You are asking that there should be insulated returns in every case?—In this case; not in the case of lines far removed from town.

If that was inserted in the Bill, it could become a positive enactment by which the Company would be bound?—Certainly.

Mr. FITZGERALD: That would leave no discretion to the Board of Trade?

The CHAIRMAN: It is a legal point.

Mr. FITZGERALD: It is a common-sense point.

In further cross-examination, witness said they adopted the system of insulated returns which the London County Council had adopted after their Engineer, Mr. Kennedy, had visited America.

Mr. BAGGALLAY (in re-examination): It is suggested that an alteration of the regulations by the Board of Trade will be made when it is proved that the present ones are insufficient. When that is proved, will there not probably have been an enormous amount of damage done to the mains of the Gas and Water Companies?

Witness: It depends on how soon the Board of Trade see fit to alter the regulations. There is no change which will absolutely protect the Gas and Water Companies except insulation. That is the simplest way to do it.

Monday, June 24.

Professor *Ayrton* was this morning recalled with reference to the statement that considerable currents due to natural causes were found to flow in pipes miles away from electric tramways, and in the rails of a tramway prepared to be worked electrically at a period when they were worked by horse power. In consequence of this statement, it seemed most important to ascertain whether any mistake had been made in regard to the currents of electricity which witness had found flowing in pipes in the Chiswick High Road. Between Friday and that morning, therefore, he, with a competent staff, had gone very fully into the matter. They started testing the current in the rails of the electric tramway at 10 p.m. on Saturday, and went on continuously for six hours until 4 a.m. on Sunday. At first, while the trams were running, the current was large—130 to 140 amperes in the four rails together. They tested all the way from the generating station to Kew. As the traffic died away, and the Company stopped running the cars, the current in the rails diminished; but, curiously enough, as soon as the cars had stopped running, and all had been shut down for the night, at 2.30 a.m. on Sunday there was a current in the rails of even more value than Mr. Salter mentioned. Mr. Salter stated that he found 15 amperes of earth currents on the road; while witness found as much as 20 amperes. This was very startling. If it were due to natural causes, as had been stated, presumably these natural causes would operate not merely between Chiswick and Kew. As the rails were laid and bonded miles west of Kew, ready for the electric tramway, but not yet working, it suggested itself to witness to go further west, beyond Kew Road to Brentford. As he went west of Kew, the current became less and less, until, when they reached Brentford, there was hardly any current in the rails at all; and what little there was, was flowing in the opposite direction towards Kew. If this was due to natural causes, probably there would be a current in the pipes. If, on the other hand, the 20 amperes were owing to what he might call unnatural causes, it would not be big enough to produce any leakage. They examined a hole they had opened by Chiswick Fire Station at 3.30 a.m. on Sunday, and there was absolutely no current that they could find in the pipe. It appeared, therefore, that, whatever causes were producing currents in the rails, they only did so east of Kew. The conclusions he was brought to were that there was a current in the rails which did not go beyond Kew, though the rails went further, and that there was no current in the pipes. Then they went east towards the generating station, and found the current was flowing to the station. When they passed the generating station, the current was flowing the other way—east towards Hammersmith, and north-east towards Shepherd's Bush. He could not help coming to the conclusion that the current was leaving the generating station. On Sunday afternoon, at 3.30, at the same place and with the same pipe, there was a current which was certainly not less than forty times as large as that which was flowing at 3.30 a.m. The current was about 4 amperes; whereas there was not $\frac{1}{10}$ ampere before. The recent dry weather would, no doubt, diminish the leakage.

Mr. FITZGERALD (in cross-examination): These stray currents which are found in the earth are not constant?

Witness: The currents we found on Sunday were absolutely constant; but hour by hour they diminished. Natural currents are currents which are not constant.

There is nothing inconsistent between what you are now stating and what Mr. Salter stated?—There is a great deal that is inconsistent. The inconsistency arises from the fact that the currents radiate, even during the small hours of the morning, from the tramway generating station at Chiswick.

Mr. Salter found the current in existence before the tramway station had ever begun to work?—Before the trams began to run.

Before the station worked?—One single accumulator attached to the rails would produce the whole of the current that we found, which was more than the current found by Mr. Salter. I do not say there was an accumulator used.

One accumulator or ten accumulators can make no difference if the station is not working?—It is not necessary to have a station.

The rails were there; but there was no accumulator attached to, or communicating with, them. There were no generators in the station at all. Therefore the suggestion you make is not based on fact?—I do not say a generator was there. I say the quantity we found could be produced by a single accumulator.

The suggestion you make is that the current Mr. Salter found there was produced in some way by the generating station?—I do not know what Mr. Salter found. The current we found was larger than that which Mr. Salter found. It came out through the rails at the generating station.

Do you suggest that Mr. Salter did not find the current he says he found?—I have never said so.

Do you suggest it came from the generating station?—I do not know. I was not present when he made the experiments.

Mr. PEMBER (in re-examination): All you are concerned to say is that, if Mr. Salter's evidence was for the purpose of showing that currents do not cause currents in the pipes, your experiments are conclusive that they do?

Witness: My experiments show that you can have, from any cause you like, a larger current than that mentioned by Mr. Salter flowing in the rails at night without any current flowing in our pipes. Therefore the cause which produces the current at night in the rails is not a cause which operates to produce a current in our pipes; whereas in the daytime, when the currents in the rails are many times as large, there are unquestionably currents in the gas and water pipes under the Chiswick High Road. The thing which produces currents in the rails during the night does not produce currents in our pipes.

Mr. PEMBER, in reply to the Chairman, said he asked for both a compensation clause and an insulated return clause.

Mr. *A. A. Gill*, Engineer to the Chelsea Water Company, gave details of the places at which the proposed tram-rails would be in close proximity to the water-mains of his Company; these mains, for a considerable distance, being those on which the Company relied entirely for the supply of their district. The Company's mains lasted for an indefinite period. They had had one very bad break which caused a considerable amount of damage. They could not account for it; they saw no signs of any flaw or of electrolysis in the main.

Mr. *William King*, examined by Mr. F. W. PEMBER, said he was Engineer to the Liverpool United Gas Company, who have about 814 miles of main. The laying of all the pipes in the district was done under his supervision. His attention had been called to the question of electrolytic action on gas-mains; and the subject had been brought forward by the Gas Companies' Protection Association. Openings were made in certain streets of Liverpool which were traversed by tramways; the streets selected being those where the trams had been longest at work. Two were made on the oldest line, which was brought into operation on Nov. 14, 1898, and which had worked continuously and increasingly since then, under the Board of Trade regulations, on the trolley system. The openings were on opposite sides of Park Lane, and about 50 yards apart. The gas-mains would be about 8 feet from the nearest tram-rail. On the east side of Park Lane there was an 8-inch main with a thickness of about 0·45 inch, which was laid in 1871, 3 feet below the surface; and on the west side there was a 6-inch main 0·4 inch in thickness, laid in 1875, at a depth of 2 ft. 8 in. In connection with the building of a church, the ground near the 6-inch main subsided, and the main was fractured. In August, 1899, a new length was therefore laid there. The recent excavation related to a portion of the old and to a portion of new pipe. When the ground was opened to repair the fracture, the pipe was in good condition, there being no corrosion. When the two openings were recently made, the pipes had a very unusual appearance, pittings being plainly visible to the naked eye. These pittings varied in depth from 0·1 to 0·15 inch. In the 8-inch main there were more than thirty pittings. There was only a short length of the other exposed; but along it there was a deep double pitting about $\frac{1}{8}$ inch in depth, so that the corrosion would be about one-third of the thickness. Practically the whole surface of the pipes exposed was affected. With regard to the 6-inch pipe, there were a number of spots, different in colour from the body of the pipe, filled with a substance which could be easily removed by a penknife. These excavations were made at a spot about 350 yards from the nearest generating station. The corrosion he referred to was entirely different from any he had ever seen. It was very different from corrosion produced by ordinary rust; and he concluded that it was due to some new cause.

By the COMMITTEE: Openings were also made in St. James's Road, Vauxhall Road, and Clapham Street, in order that the electrical expert might test the current flowing along the pipes. The soil in St. James's Road was very dry sandstone rock. In the other places the ground was ordinary sandy clay and soil.

Further examined: The ground at Liverpool was remarkably good for the preservation of pipes. He considered that mains laid in it were practically indestructible. Where the corrosion was discovered, the soil was good ordinary ground, slightly damp. There was nothing in the soil there, or the dampness, to account for these unusual and eccentric pittings; nor was there anything in the character of the pipe to explain the peculiar appearance. He had never had to take up a pipe in consequence of corrosion of the ordinary kind.

Cross-examined by Mr. FITZGERALD: There was not a great deal of made-ground in Liverpool. He was not able, as an electrician or a chemist, to tell what had caused the corrosion. The Liverpool Gas Company were members of the Gas Companies' Protection Association, which had been recently formed to protect Gas Companies' interests. The Association had been opposing practically every Bill introduced for the purpose of electric traction.

Mr. *C. C. Carpenter*, examined by Mr. F. W. PEMBER, said he was Chief Engineer to the South Metropolitan Gas Company, who had a district of supply of from 50 to 60 square miles, and about 1000 miles of mains. About a year ago, one of the Company's inspectors called his attention to an escape of gas in the 4-inch main which supplied the generating station of the City and South London Electric Railway, at Stockwell. He found the main ruined, and in the condition which had been described; and it was renewed. He produced a piece of the 3-foot high-pressure main from which the 4-inch main was supplied. It was extensively pitted, and in a manner which was quite new to

him. Practically the Company never had to renew a gas-main because it was worn out. Sometimes it was necessary to substitute a larger main for a smaller one, owing to the growth of the gas consumption. In that case, the smaller mains would be re-laid in another part of the district.

Cross-examined by Mr. FITZGERALD: His suggestion was that the escape of gas was caused by electrolytic action. The 3-foot main of which he produced a piece had been down ten years. The City and South London Railway was, until a year ago, not under the Board of Trade regulations. It had been working for eight or nine years.

Mr. FITZGERALD: Are you prepared to say that there is any evidence at all in regard to electrolytic action on the 4-inch main?

Witness: Certainly. I have been connected with the South Metropolitan and other Companies for 25 years. At one time I had charge of the main-laying; and I have never seen anything like that action.

How do you explain the fact that the water-pipes in the immediate neighbourhood show no trace of that kind of pitting?—The water-main was in one place so soft that I could scratch it with my nail; and my nail went in below the surface.

Can you name any place in your district, where the Board of Trade regulations have been in force, and where electrolytic action has been caused?—We have nothing in South London.

As Mr. Pember was about to call another witness,

The CHAIRMAN (interposing) said: Is not this question a matter of equity and justice now, not a matter of science? We can get any number of witnesses to say there is this danger of holes being made in pipes. Shall we get any more forward by proving fresh cases?

Mr. PEMBER: On the assumption that you consider the whole question of the scientific results of electrolysis is before you, I do not think it would be fair of me to call more evidence at length. I am very soon satisfied with scientific evidence; but I think that Professor Perry and Professor Dewar would like to be called, to say that they agree generally with Professor Ayrton. If you will allow me, I will put the evidence in that way.

Professor *Perry* said he adhered to a statement which he made in his Inaugural Address to the Institution of Electrical Engineers—viz., "If we do not insulate our returns, electricity will certainly return by gas and water pipes; and the amount of harm done to these pipes is merely a question of time." He agreed with everything Professor Ayrton had said. To insulate the returns on a tramway working on the trolley system would cost about £400, certainly not more than £600, per mile. Supposing it to be a fact that the corrosion of pipes in the part of London which was affected by the City and South London Railway took place before the introduction of the Board of Trade regulations, he still maintained that the electric current now flowing into the gas-mains in Clapham was sufficient to produce an effect.

By the COMMITTEE: He thought the regulation of the Board of Trade with regard to bonding the connections between the pipes of the Gas and Water Companies and the electric station was very wrong indeed; and Mr. Parshall, one of the witnesses on the other side, agreed with him. Mr. Parshall, in a paper which he read before the Electrical Engineers in 1898, said that if the pipe and rails were bonded together to keep the current at the same potential, stray currents would flow from one part of the system to another at such tension as to cause electrolysis. Witness did not think the Board of Trade, when they framed their rules, had in mind the great resistance of joints in pipes. If a water-pipe were connected with a rail at the generating station, it was a great deal easier for the current to pass along the pipe elsewhere; the real danger was at the joints. If there was resistance at the joints, the current would jump them; and this was a very serious thing indeed. He did not think it could be remedied by bonding the joints with copper. If they did bond with copper or any other metal, there would be corrosion because of the proximity of the two metals to one another. If there were two metals close together in moist soil, they would attack one another.

Professor *Dewar* said it was since the date of the Commission on London Water Supply that the question of electrolysis had become acute. No actual cases of corrosion had occurred in this country or America; but he then stated that if currents did circulate in gas or water pipes it would be inevitable and damage must follow. He had pointed out that the damage would not be the equivalent of the attack upon iron merely due to the current itself, but the increased natural corrosion caused by the current making the surface of the iron more easily attackable. There was a double attack on a pipe when it was electrolytically affected. He agreed with Professor Ayrton and Professor Perry in their views with regard to electrolysis.

By the CHAIRMAN: The only absolute protection would be an insulated return. The more they diminished the current circulating in the pipe, the less danger there would be of electrolysis.

The CHAIRMAN: Supposing a compensation clause was inserted, and damage was done, would it be easy to fix the authors of the evil? Might there not be a good many currents besides those from the electric car?

Witness: I do not think so. I think the only known cases of the pitting of pipes such as you have seen, arises from the action of acid subsoil where there is sulphuric acid generated from pyrites, and where therefore the attack on the pipes is a local electrolytic action. That occurs when there are abnormal conditions in the subsoil—usually when the subsoil is artificially made. An electrolytic attack in an ordinary subsoil could not occur from that cause. Undoubtedly the Company who are responsible for the circulation of the current are causing electrolytic damage.

You say it would be easy to fix upon the authors of the evil?—I do not say it would be easy. You would require legal powers to suspend traction for a time for the purpose of an experiment, in order to ascertain who originated the currents circulating in the pipes.

In further examination, witness said he did not think anything other than electrolysis could have caused the mischief to the pipes at Liverpool. The subsoil of Liverpool was good; and if there was anything abnormal in the condition of the pipes, it must have been due to some abnormal cause. With regard to water-pipes, it was customary to try to guard them by immersing them in pitch—Angus Smith's composition—the object being to make them last longer. The joints were all made with this composition. It was therefore easy to understand why the resistance at the joints varied so much. There might be no actual contact between the lead and the iron at the joints, owing to there being a thin layer of this substance between. That would limit the attack of the current.

Mr. PEMBER: You have seen these various pieces of pipe. Have you any doubt that their condition is the result of electrolysis?

Witness: I have no doubt whatever.

The CHAIRMAN: You think the Board of Trade regulations are not sufficient to protect the interests of the Gas and Water Companies?

Witness: No. They should insist on far less current circulating in the pipes. Instead of making it some volts, it should be a fraction of a volt.

Would it be possible to work the tramways then?—Yes. It would be an approach to an insulated return.

This closed the evidence.

Mr. PEMBER then addressed the Committee for the Water Companies. He said he was raising a most important question of principle, in respect of which he was appealing on behalf of the Chelsea Water Company, who practically were representing all the London Water Companies, with the exception of the East London and the Kent Companies, whose mains were not affected by the proposals before the Committee. The Committee had heard enough to warrant the statement that no one in his senses could doubt the extreme importance of the principle involved. What was at stake was the security of the London Water Supply. He did not hesitate to say that, in his poor judgment, it was far better to have no electric tramways at all in London, than to chance having the water supply interrupted by the bursting of one or more of the great water-mains. As to the danger, or the origin of danger, to the water-pipes, there seemed to be no longer any real doubt. Where uninsulated earth returns were used, whether for tramways or underground railways, or any electrical purpose whatever, the loose unguarded currents would find their way to their source by any conductor they chanced to meet with on the way. Of course, the water-pipes constituted such a conductor on a very large scale; and it had been demonstrated experimentally that electricity availed itself of their being in the ground. One of the suggestions made on the other side was that the currents in the water-mains might be only natural currents arising from divers causes; but, if this was true, he thought it also fair to say that, if currents of natural electricity were flowing to and from the mains, there would years ago have been a catastrophe in connection with the pipes of the London Water Companies. Sir William Preece's declaration that 10,000 years at least would be required to corrode a water-main sufficiently to cause a catastrophe, might be dismissed with a word. One of the witnesses he had called had showed that, in the course of only two or three years, underground pipes had become so pitted by electrolysis that holes might be scraped out of them with the point of a penknife. The Clapham Road experiment was clear enough. At the time the City and South London Railway was working under Board of Trade regulations, the currents were found rampant during the working hours; and they ceased proportionately at mid-night, when the trams left off running. There was also the experiment at Chiswick. While the tramway was running, great currents were found to exist in the rails, and there were currents in the pipes; but directly the cars ceased to run, exactly what one would expect was found to prevail—that was to say, there was a falling off of current, and, by a well recognized transition from strength to weakness, it eventually died away altogether. At that time there was also found to be no current whatever in the pipes. It was evident that the current was in existence during the working hours of the tramway, and ceased when the tramway stopped. Two suggestions were put forward on the part of the Tramway Company in relation to the Clapham Road experiment—first that the tubular railway dispensed a larger amount of electricity than the tramway; and, secondly, that the damage which might have been done to the water and gas pipes by the City and South London Railway was done when the railway was not working under the Board of Trade regulations. But these arguments were disposed of by the Liverpool experiments. Supposing a larger amount of electricity were dispensed by a tubular railway than by an electric tramway—which he very much doubted, seeing that the tube encasing the railway itself would carry the current away—that would only affect the Clapham case, and would have no bearing upon that of Liverpool. In Liverpool, there was, obviously, only one offender—viz., the tramway.

Mr. BALFOUR BROWNE pointed out that there was an electric railway running all round the docks in Liverpool.

Mr. PEMBER said that was true; but the pipes which were found to be corroded were all in a different part of the town, and there was no suggestion that they were affected by the electric railway. The electrolysis in the Liverpool gas-pipes was clearly caused by the tramway; nor was there any suggestion to the contrary made in cross-examination. Moreover, the tramway was working under the Board of Trade regulations, which disposed of the argument that the damage at Clapham might have been done when the railway was not working under Board of Trade regulations. The injury arose from the entry of the current into the pipes, and the effort it made to leave when some slight obstacle diverted it. The most usual cause of diversion was, he thought, given to the conductivity of the pipe itself by its joints, which offered an obstruction to the current wherever they were encountered. It was said that if the joint was coupled up near the generating station, or there were a connection between the pipe and the generating station, this would get rid of the difficulty. But that was not the case. No doubt it would get rid of the difficulty so far as one joint was concerned; but it would not affect the thousands of joints in the miles and miles of pipes which existed elsewhere. Wherever there was a faulty joint, the current jumped; and this occurred from 600 to 1000 times in the course of a mile. Though a joint might be perfectly watertight, it might be a bad electrical conductor. The pipes were some of them very old; and they had been laid down as water-pipes, and not with the object of making each line of pipes an electrical conductor. To make them good electrical conductors would mean enormous expense, and would involve work quite outside the business of the Water Companies. Besides, it would cause such an interference with

the traffic of the streets that it would not be allowed for a moment. The learned Counsel then described the process of erosion, and pointed out that, according to Professor Sylvanus Thompson, 1 ampere of electricity removed 15 grains of iron per hour from a pipe, which would mean 14 lbs. in the course of a year. If this amount of iron were removed in a year, it would carry a great many things into the air—amongst others the 10,000 years which Sir William Preece said it would take to do any damage to a pipe. It must be borne in mind, too, that this erosion took place underground. The first self-expression of the mischief which would come from the pipe, would take the shape of a terrible disaster. He did not see how they were to get out of that. Would not the Committee safeguard the public against such a disaster, or would they shield themselves behind the Board of Trade regulations? Every circumstance of the case rendered these regulations ineffective. The Board of Trade did not attempt any inspection of the tramway system of London. As the late Sir Courtenay Boyle said years ago, the growth and extension of the tramway system over an expanse of hundreds of miles would make any attempt at such inspection absolutely futile, even if it had not been so already. Sir William Preece, who was, or had been, Engineer to the General Post Office, said that the Board of Trade regulations were not carried out. Who would venture to say that, as things stood now, the Board of Trade regulations safeguarded the interest of anyone concerned? However competent an army of inspectors might be, they never would be able to find out the damage that was going on underground, and which was occurring, very likely, at hundreds of places at the same time. Mr. Trotter, of the Board of Trade, had been examined in the Bexley case; and he had said: "In this inspection of the tramways, I do not, as has been suggested, make it in order to see whether the Board of Trade regulations are carried out or not." But though inspection took place, the inspectors could not see what was taking place, even if the Board of Trade regulations were carried out, and even if the regulations were sufficient. The Board of Trade had no knowledge of how, and why, and to what extent, their regulations were insufficient. If they were carried out and were insufficient, not only, as the law at present stood, was there no damage occurring to the tramway companies who were carrying out the regulations, but, furthermore, there was no protection whatever to the public. Sir Courtenay Boyle had told them plainly that all the inspectors could do was to make themselves acquainted with the condition of the tramways, and go down to any place where an accident occurred. Unfortunately, in the case with which the Committee were dealing now, to come down after an accident would be too late. It would be absolutely useless to give scientific advice after one of these great trunk mains had burst, and great damage had been done to life and property. Supposing that an occurrence of the kind took place, and the Board of Trade, taught by their sad experience, came to the conclusion that there should be insulated returns, where, under the regulations, was there power to insist upon such returns being constructed? The model clause of the Board of Trade said, in the first paragraph: "The Company shall employ either insulated returns or uninsulated metallic returns of low resistance."

The CHAIRMAN: Is that not sufficient?

Mr. PEMBER said it certainly was not sufficient. It was in the working of this regulation that the Water Companies said all the mischief as to electrolysis had arisen.

The CHAIRMAN: What returns do you want?

Mr. PEMBER said the Water Companies wanted insulated returns. The provisions of clause 12 of the Bill gave the Tramway Company power to employ either insulated returns, or uninsulated metallic returns of low resistance. The second sub-section said: "The Company shall take all reasonable precautions in constructing, placing, and maintaining their electric lines and circuits and other works of all descriptions, and also in working their undertaking so as not injuriously to affect, by fusion or electrolytic action, any gas or water pipes or other metallic pipes, structures, or substances." They were to take all "reasonable precautions." In sub-section 3, the clause said: "The electrical power shall be used only in accordance with the Board of Trade regulations; and in such regulations provisions shall be made for preventing fusion or electrolytic action of, or on, gas or water pipes," &c. But this regulation did not prevent fusion or injurious electrolytic action. His position, however, was clearly defined by sub-sections 1 and 2, which he had read. The Board of Trade, even if they found out by sad experience the imperfection of their regulations, were not able to order insulated returns. All they could do would be to go on and strengthen their regulations in regard to uninsulated returns.

The CHAIRMAN: Outside this Bill, you say that the Board of Trade have not power to require insulated returns?

Mr. PEMBER: None whatever. The whole of these powers were in the direction of uninsulated returns. There was nothing to lead the minds of the Board of Trade officials towards the conception that there was anything going wrong; and even if their minds could be so led, there was nothing to empower them to apply the only true remedy for the prevention of electrolysis. Nearly all their knowledge of electrolysis was subsequent to the sitting of Lord Cross's Committee. Although the Water Companies were before that Committee, and although they even called Professor Dewar, this matter, so far as they were concerned, was gone into very cursorily—Professor Dewar's evidence only occupying half-a-page. Professor Dewar, with true scientific insight into the future, prognosticated some of the evils which had since occurred; but still the Water Companies took very little part in the discussion. Even in 1898, Lord Cross was not educated as they were now in this matter. The truth was that the Water Companies had very little part to take in the inquiry of 1893; the inquiry not being sufficiently directed to their case, but, on the contrary, it was specifically directed to another matter altogether. It was only in a kind of side-fashion that the question of electrolysis was raised at all, and then at the last moment. The inquiry really arose out of the relations existing between the National Telephone Company and the tramways. The National Telephone Company had obtained protective clauses in many instances against electric tramways; and these clauses were of a most absolute character. The tramway companies said it was owing to the extreme delicacy of the Telephone Company's wires that the necessity for the Telephone Company interfering arose, and that their demand for absolute protection was practically a claim for a monopoly of the earth. The contest was one which was renewed year after year; and it later on brought about Lord Cross's Committee. The main business of that Committee was to settle the question. The chief evidence was as to the interference with the telephone lines by the tramways, and the great convenience of the tramways to the public. There were two or three points in the report of the Committee of 1893 to which he would draw attention. Where he thought the Committee went too far was in saying, when so little was known on the subject, that danger could be reduced by improved methods of construction so as to be practically negligible. In the course of the investigation, the Committee discovered that the Telephone Company, for their own sake, ought to adopt the double-wire system or overhead return, and not depend on the underground return. Lord Cross and his colleagues came to a thoroughly sensible conclusion—that, though they ought not to be driven to it by the tramways being left uncontrolled, if the telephone system found they could not subsist with an underground return, they must protect themselves. The establishment of the Board of Trade regulations was a compromise between the telephones and tramways. But the Water Companies were not in an analogous position. The question here was not with the Tramway Company a question as between industry and industry. The water-mains were in the ground, and there they must lie. There was no reason why they should move them. They had no remedy as the Telephone Company had; and if they were injured, it would be by the Tramway Company. They were, and must remain, passive. They were the first in the ground—the ancient holders of the earth. The Tramway Company were the aggressors. The Water Companies were indispensable to London and its 6,000,000 inhabitants. London could do without the tramways; it could not do without water. The Water Companies were the purveyors of one of the two great necessaries of life, and the one which it was far more difficult to purvey. The question between the Water Companies and the Tramway Company was only one of £ *s. d.*—the cost of insulating the return. If the overhead system were retained, the cost would be from £400 to £600 per mile. If the conduit system were used, the cost would be greater; but in neither case could it be prohibitive, because already more than one tramway company had submitted to an absolute compensation clause. The London County Council were doing so in connection with all their schemes which were on the conduit system, which was by far the most expensive to render innocuous. In this respect the trolley system was far cheaper than the conduit system.

The CHAIRMAN: Mr. Trotter remarked that in the case of this system the conduit traction was prohibitive.

Mr. PEMBER said that the London County Council did not think so, or they would not be adopting it. The House of Lords had been the first of the two Houses to show willingness to reconsider this matter. The House of Commons was a little more prone to leave questions of this kind to the Public Departments. This, he thought, was not right. Leaving a question to the Board of Trade did not after all amount to much. It meant leaving the matter to the discretion of one individual.

The CHAIRMAN: You secure uniformity.

Mr. PEMBER: Yes; until the person in charge of the Department dies. Till quite lately, the Court of Referees in the Commons would not even grant *locus standi* to a water company to have the question discussed.

The CHAIRMAN: Did they give way in the Bexley case?

Mr. PEMBER: No; the Bexley people did not raise objection to the *locus*.

The CHAIRMAN: Did the present case come before the Referees?

Mr. PEMBER replied in the affirmative. Permission to appear was also given to some small water company last year. Mr. Baggallay and himself brought the matter seriously before the Referees this year; and he hoped that some new departure would be the result. There were three methods by which the Committee could give the Water Companies protection. First, there were the Board of Trade regulations; secondly, compensation; and, thirdly, insulation. The Board of Trade regulations had been proved to be insufficient. Regulations could not be framed of the far-reaching character necessary. Compensation had been countenanced by the House of Lords to a substantial extent. They said that, unless there was perfect insulation, there must be risk to the mains; and they had more than once granted a compensation clause. The Water Companies would have a certain amount of remedy given to them by this clause, though it was a clumsy way of proceeding to allow the damage to be done, and then give compensation for it. There might be great difficulty in proving the damage, and there might be a risk of failure of justice; but it was a step in the right direction. This, however, did not help the consumer. What about London, if a large portion of it lost its supply of water? That showed the weakness of the compensation clause. The third course was to insist upon insulation.

The CHAIRMAN: If the Board of Trade regulations were out of the way, would you have a remedy at common law?

Mr. PEMBER replied in the negative. The promoters were under statutory powers, and special negligence would have to be shown in the carrying out of the powers. The clause no doubt would tend to make the Company more careful than they otherwise might be; still it was not a satisfactory protection for the public. It had been several times before Parliament. First, on the Croydon Bill last year in the House of Commons, the Lambeth Company asked for the clause; but it was refused. This Bill was promoted by the Croydon Corporation, and only a small portion of the mains of the Lambeth Company was affected; while the Corporation, who were the Water Authority, had a large system of mains under the tramway. The Committee might have thought that the Corporation would take care of their own mains, and in doing so would take care also of those of the Lambeth Company. The next instance was the Bill of the London County Council asking for powers to work their tramway by electricity. The Lambeth Company came before the Commons for a clause; and it was refused. But it was known that the London County Council were going to adopt the conduit system; and the Committee might have thought that the Council would make them so safe that a compensation clause was unnecessary. In the House of Lords, however, Lord Camperdown gave them the compensation clause; and notwithstanding this, the London County

Council took the Bill. A Power Distribution Bill followed, in which the clause was accepted by the promoters. This year, the Sheffield Corporation Bill had the clause in it; and it was made retrospective. The Bill was unopposed. In the Bexley Bill the clause was asked for; but the Company was a small one, and the cost was thought disproportionate to the capital. The Earl of Ducie, however, put the clause in the South Lancashire Tramways Bill. The promoters of the Finchley and Hendon Tramways Bill had put the clause in voluntarily. The London County Council, in all their Bills this year, had voluntarily inserted the clause. Finally, he submitted that to leave the Water Companies to the Board of Trade regulations would be an injustice, both to the Companies and the public. The compensation clause was better than nothing, as it would tend to make the Tramway Company more careful; but the real remedy was insulation.

Mr. BALFOUR BROWNE, in replying on the case, said Mr. Pember had stated that this was a matter of great importance. It was a matter of far greater importance than even Mr. Pember seemed to understand. The whole principle of legislation was that a body which was authorized by Parliament to do something in the public interest was not to be liable to compensate anybody unless that body was negligent. That was fully borne out by the Select Committee of 1898. Mr. Pember, all the way through, had asked the Committee to put upon the promoters the obligation to use insulated returns; but in not a single case which he quoted were insulated returns put upon the promoters. Against this, he would put the statement in the report of Lord Cross's Committee of 1893, that "the Committee, having regard to the evidence before them, are of opinion that it is not, in the present state of electrical science, in the interests of the public to insist upon electrical tramways using an insulated return conductor, and that such insistance would retard the development of electric traction." The whole question of electrolysis was gone into very fully by that Committee, contrary to Mr. Pember's assertion that it was a mere side issue between the telephone and electric traction companies. Sir F. Bramwell, Dr. Hopwood, and Professor Dewar were before that Committee, and supported the view that there should be insulated returns; but the Committee did not agree with them. They thought there might be a difficulty about electrolysis. They said: "The danger from fusion or electrolytic action appears to the Committee to have arisen from a faulty system of constructing electric tramways; and they are of opinion that it can be reduced by improved methods of construction, so as to be practically negligible. The Committee therefore recommend that the Board of Trade shall, in virtue of the powers to be conferred upon them by each Act or Order, make regulations to secure the best system of working electric tramways or railways, having regard to the expense incurred by the carrying out of such regulations and to the effect thereof on the commercial success of the undertaking." Those were the very words of the clause now in the Bill. After this recommendation, the Board of Trade had to consider how to carry it out. In 1894, therefore, they called a conference at which every interest was represented, and at which the regulations were drawn up.

Mr. HELME: Would you, on behalf of the promoters, admit that if in future the Board of Trade developed stricter conditions, they would be retrospective—that the powers granted by this Bill would necessarily fall under the new regulations?

Mr. BALFOUR BROWNE: Absolutely. He went on to point out that Mr. Pember had not understood that the Board of Trade could put the promoters under obligation even to have insulated returns, if they thought fit. They had the power, though he (Mr. Balfour Browne) did not think they would give such a direction, because it was not necessary. The Board of Trade had almost absolute power, because it was provided, by incorporating a clause in a former Act in the Bill, that the carriages used might be worked by animal or by mechanical power, but, in the latter case, subject to the condition that such power should not be used except with the consent of, and according to a system approved by, the Board of Trade. If the Company did not comply with the Board of Trade regulations, the Board could absolutely make them cease using mechanical power. The Board of Trade had, in effect, said, and quite rightly, that if anyone could show that the present regulations were defective, they would make them effective, but that no case had been made out for alteration. The Committee had been to some extent misled in this case by comparisons with the South London Railway. The regulations for tube railways were entirely different from those with regard to tramways. It was a very extraordinary thing that the only two cases in which the petitioners said there was electrolytic action due to electricity, were at Clapham and Liverpool. Sir William Preece, representing the Post Office, was asked by the Joint Committee in 1898: "Are you satisfied with the clause which the last Joint Committee put in?" He said: "Yes; and it has been carried out in all subsequent Acts. We are quite satisfied that it is working; and the only case where we suffer at all is in the case of the City and South London and Liverpool Railways, which were exempt from the clause, because they were constructed prior to the meeting of your Committee." The only pretended cases of electrolysis were in Clapham Road, on the South London Railway, and in Liverpool. In these circumstances, would the Committee set aside the very careful work of Lord Cross's Committee, the careful protection given to these Companies by the Board of Trade regulations, and give protection, in addition—protection which no one at present had—against a statutory Company? There was not a single case in which a Committee of the House of Commons had given more than Lord Cross's clause; and he asked the present Committee to act in the same way.

The CHAIRMAN: Is clause 12 of your Bill the revised model clause drawn up by Lord Cross?

Mr. BALFOUR BROWNE: Yes.

The CHAIRMAN: Is it the clause in your Bill of last year?

Mr. BALFOUR BROWNE: Yes, word for word.

Mr. HELME: Then the two systems—the existing and authorized lines and the proposed extensions—would fall under the same regulations of the Board of Trade, provided the Committee accept the view you are now stating?

Mr. BALFOUR BROWNE: Yes; absolutely.

The CHAIRMAN: The Committee are of opinion that the preamble of the Bill is proved in regard to clause 12.

The Committee then adjusted the clauses, and the Bill was ordered to be reported.

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE—KING'S BENCH DIVISION.

Thursday, July 4.

(*Before Mr. Justice* BRUCE.)

Moore v. Nuneaton Gas Company—Delivery of Coke under Contract.

This was an action to recover damages in respect of the non-delivery of coke by the Nuneaton Gas Company, in accordance with the terms of a contract dated July 19, 1899. Defendants contracted to sell 1500 tons of gas coke, at 10s. 6d. a ton, for delivery over twelve months from July, in monthly consignments. They delivered a certain quantity; but at the end of the year there remained a balance of 594 tons 4 cwt. undelivered. Defendants contended that they had always been ready to furnish the whole quantity in the manner stipulated, but that the plaintiff was not willing to accept and pay for it, or to provide boats or waggons at Nuneaton for its delivery. By way of counterclaim, the defendants sought to recover damages for the non-delivery of a certain quantity of gas coal.

Mr. DICKENS, K.C., and Mr. E. MORTEN appeared for the plaintiff; Mr. RAWLINSON, K.C., and Mr. TEMPLE FRANKS represented the defendant Company.

During the course of the plaintiff's case, a question arose as to the construction of the coal contract; and, after argument,

His LORDSHIP gave judgment. He said the question which arose on the construction of the contract of July 5, 1898, was one which it was agreed should be decided at once, leaving the other matters to be decided hereafter. The contract was for the purchase and sale of 1500 tons of screened coal and 1500 tons of nuts, with delivery over one year from July 1, 1898; deliveries to be as required by the Manager of the Gas Company, in as nearly monthly quantities as possible. At the foot of the contract were these words: "Above quantity may be increased or reduced by 10 per cent. at buyers' option on giving notice of their intention so to do;" and it was on these words that the question arose. At the end of December, the Gas Company gave notice to increase the quantity; and Counsel for the plaintiff contended that this notice operated only to increase by 10 per cent. the amount of coal then undelivered. On the other hand, for the Gas Company it was contended that the notice operated to increase the whole contract quantity by 10 per cent. He thought, according to the natural meaning of the clause, the words "above quantity" referred to the contract quantity. The contract was for 3000 tons; that was the quantity which was to be increased or reduced 10 per cent. at the buyers' option. There was nothing in the clause to limit its operation to the quantity undelivered at the time of the giving of the notice. It was true it was a term of the contract that deliveries were to be in monthly quantities, as nearly as possible; but these depended upon, and must be regulated by, the total quantity. If this was increased or reduced, so in proportion must the monthly quantity be increased or reduced. The monthly deliveries made prior to the notice could not be affected by the giving of the notice; but when the contract quantity was increased by 10 per cent., the future monthly deliveries must be increased in like proportion—that was to say, 10 per cent. of the contract quantities to be distributed over the months during which deliveries were still to take place. It was said, on behalf of the plaintiff, that it was unreasonable that the buyer should have a right at any period of the currency of the contract—even the last month or the last day of it—to increase the quantity so as to render the last monthly delivery wholly disproportionate to the other quantities. He was not called upon to determine what the rights of the parties were in such an extreme case. Though no time was fixed, the purchaser was bound to exercise the option within a reasonable period; and he (his Lordship) could not hold that the exercise of it in December, when there were several months of the contract to run, was unreasonable. He came to the conclusion that when the buyers gave notice in December to exercise the option, they were entitled to increase the contract quantity by 10 per cent., and to have so much of the quantity as remained undelivered, increased and distributed over the remaining months of the contract.

The hearing of the case was then proceeded with. Evidence was given that the specified quantities of coke were not delivered; that after the date of the contract the price of coke rose rapidly; and that it had been the practice of the Gas Company for many years to send the coke in waggons belonging to the Railway Company, if the plaintiff failed to send waggons or boats.

Mr. RAWLINSON, in opening the case for the defendants, said they were undoubtedly required to deliver coke into boats or waggons at Nuneaton in monthly quantities; and he argued that each quantity, being a definite amount, was a separate contract. It was not a vague contract, like that relating to coal, because the number of tons to be delivered monthly was clearly indicated. Before the defendants could be held to be in the wrong, it must, he contended, be proved that they had refused to deliver after being required to do so. As there was no request, there could be no default.

Friday, July 5.

On the hearing of the case being resumed this morning,

Mr. *G. Helps*, the Company's Engineer and Manager, gave evidence to the effect that there had been no breach of contract on their part, and that whenever a request was made, coke was supplied.

Counsel having addressed the Court at considerable length, for their respective clients,

His LORDSHIP gave judgment. He said in this case the plaintiff sued on a written contract under which the defendants sold 1500 tons of coke at 10s. 6d. per ton, deliveries to be over twelve months from the date of the contract, in boats or waggons, at Nuneaton, in monthly quantities—July and August, 60 tons; September, 90 tons; October, 120 tons; November, 180 tons; December, 240 tons; January, 240 tons; February, 180 tons; March, 120 tons; April, 90 tons; May and June, 60 tons each. In all, 905 tons 16 cwt. were delivered—leaving a balance of 594 tons

4 cwt. undelivered, in respect of which a sum of £208 was claimed as damages; being at the rate of 7s. per ton. No deliveries were made under the contract in July, August, and September; in the next few months the deliveries were less than the stipulated quantities; but in May, June, and July they were slightly in excess of them. Defendants said they were always ready and willing to deliver the coke in the manner provided for; but, the plaintiff having neglected to provide boats and waggons, they were released from the performance of the contract. Plaintiff, having resold the coke to Messrs. Kay and Son, seemed to have left it to this firm to provide the boats and waggons; and, notwithstanding constant letters from the Company asking for waggons, &c., they were not sent. He had come to the conclusion that the defendants were always ready and willing to supply the coke, and therefore judgment must be entered in their favour. As to the counterclaim for damages in respect of short delivery of coal, he awarded them £22 10s. and the costs of the action.

HIGH COURT OF JUSTICE—KING'S BENCH DIVISION.

Tuesday, July 2.

(*Before Mr. Justice* LAWRANCE *and a Special Jury.*)

Vicars v. Hydro-Incandescent Gaslight Company, Limited.

In this case, the plaintiff brought the action against the Hydro-Incandescent Gaslight Company, Limited, and five Directors and promoters, claiming damages for alleged misrepresentation in the prospectus. Plaintiff alleged that he was induced to apply for shares in the Company on the faith of a prospectus which was issued by the defendants—the Directors and promoters. He said the prospectus contained certain misrepresentations, which were fraudulently made by the defendants; or, in the alternative, that they were made by the defendants without their having any reasonable ground or belief that they were true. The defendants put in several defences. They denied that the prospectus was issued by their authority, or that it contained any misrepresentation; or, if it did, they said that the statements were not fraudulent, and that they had reasonable ground for believing them to be true.

Mr. C. A. RUSSELL, K.C., and Mr. DISTURNAL appeared for the plaintiff. The Company were unrepresented. Mr. E. H. COMBE appeared for the first Director (Sir William Robinson, G.C.M.G.); Mr. RAWLINSON, K.C., and Mr. HERBERT CHITTY, for the next Director (Mr. Henry A. Greig); and Mr. MONTAGU SHEARMAN, for the third Director (Mr. Sidney Marler). The other defendants—Maurice Joseph Wells and Samuel Husbands Beckles, the promoters—were unrepresented. Mr. Wells appeared in person.

Mr. RUSSELL said the plaintiff was a member of a firm of designers and art embroiderers in Newgate Street; and he claimed to recover £300, which he had paid for 300 £1 shares allotted to him in June, 1898. The Company was in liquidation; and a receiving order had been made against Wells. The Company was registered in May, 1898, with a capital of £200,000, divided into £1 shares; and it was described as working under contract with the Welsbach Incandescent Gaslight Company. As a matter of fact, all that the Company ever had was an interest in a patent which professed to show a way of increasing the illuminating power of gas, by subjecting the gas, as it passed from the service pipe to the actual lighting jets, to the pressure of water. This was an idea which was not at all novel. It was perfectly well known before this patent that one of the methods of applying pressure to gas for the purpose of increasing the lighting power was by means of hydraulic or water power. The patent was originally taken out in this country in March, 1897, and was eventually sold or assigned to the Internationale Hydro-Press Gas Compagnie of Hamburg, for £50. This sum increased by intermediate stages to the £180,000, at which it was sold by the defendant promoters to the Company. He should suggest that the original sum of £50 was by no means an unfair valuation of the merits of the invention; and there was absolutely no justification for the horribly inflated price which was nominally obtained by the promoters. The first paragraphs of the prospectus said: "This Company has been formed for the purpose of acquiring the whole of the British, Indian, Australasian, South African, and Canadian patent rights, and all other rights incidental thereto, of the hydro-incandescent gaslight, and the benefits of the valuable licence with the Welsbach Incandescent Gaslight Company, Limited. This Company has had transferred to it a contract and licence with the Welsbach Incandescent Gaslight Company, whereby the latter undertakes, for a minimum period of five years, to manufacture and sell the apparatus, paying over to this Company 50 per cent. of the gross profits, not charging anything for establishment expenses, advertising, or cost of selling and placing on the market, and during the continuance of the licence not to make use of any other hydraulic gas-pressing apparatus; and that in the further event of the contract being determined, this Company is to be deemed to have a licence to use the Welsbach mantles and burners, and the Welsbach Incandescent Gaslight Company are to supply such mantles and burners at a discount of 30 per cent. from the current price." The plaintiff said this did not properly or accurately describe the effect of the agreement with the Welsbach Company; and he alleged that there were most serious misstatements, for which there could be no possible excuse. It was really a case of "heads I win, tails you lose" with the Welsbach Company. Only £12,482 was subscribed by the public; but the Company went to allotment on that. The patent apparatus, however, had absolutely broken down; and the whole concern had been a failure. The quantity of water required for the proper pressure—60 lbs. per square inch—was so enormous, that no water company who knew anything of it would allow it for a moment. The pressure used by the ordinary London consumer was seldom more than 30 lbs. to the inch. The prospectus stated that the General Manager of the Company was "late of the Welsbach Company;" but the fact was he had only occupied a place in the counting-house of the Welsbach Company, and had not held the practical position that was implied.

Mr. *William Vicars*, the plaintiff, gave evidence in support of his case, and said he saw the light on exhibition before he applied for the shares. He thought it was a valuable invention then, and continued to believe so until the statutory meeting on Sept. 18, 1898, when he told the Directors straight that he thought it was a swindle, and he was surprised at respectable gentlemen like themselves being concerned in it.

John Barclay, a foreman in the employ of the Welsbach Company, said when they exhibited the hydro-gaslight in 1898, at Niagara Hall, they used water from the fire hydrants; and even then the water pressure was not enough to keep a few lights burning for any length of time. Only one would burn steadily. When the light was exhibited at Winchester House, 30 lbs. pressure was insufficient; and the burners had to be connected with a hydraulic main. The people who viewed them could not see the connection, as that was kept under lock and key. An enormous quantity of water was used. The machine would not act at the pressure it was supposed to work at; and the connection with the hydraulic main was kept secret. He acted honestly, though he did not know what other people did. He had to make a success of it. Mr. Augspurg, the Managing-Director of the Hydro Company, was formerly clerk to the Welsbach Company.

Cross-examined, witness said that he was promised a cheque by the promoters if he made a success of the show; but he never got it. Mr. Augspurg knew no more about incandescent gas than his boots.

Mr. *James Keith*, a specialist in automatic and hydraulic gas appliances, said he was acquainted with Rothgiesser's patent apparatus, which belonged to defendant Company. The principle of the apparatus—applying pressure to increase the light—had been known for fifty years past. It was only practical if the pressure required was available. It was very expensive, and could not be used with the ordinary London water supply. Further, it would be very dangerous; and no water company would allow it to be attached. In his opinion, the prospectus was not correct in saying the invention embodied a practical, useful, and ingenious advance in gas lighting. On the contrary, it was a retrograde step.

Cross-examined by Mr. RAWLINSON, witness admitted that the idea of applying hydraulic pressure to gas was new in 1896. He and his son had recently taken out a patent similar to Rothgiesser's; but they were not rivals, because 500 people were using his method, whereas none that he knew of employed the other. Witness's patent could be used with the smallest pressure ordinarily obtainable.

By Mr. SHEARMAN: He thought the Somzee-Greyson patent was the master patent, and that the Rothgiesser patent was invalid.

By Mr. COMBE: He had refused to sell his patent to the Welsbach Company or to anyone else, for any sum.

Mr. *F. J. Tomlinson*, a merchant, of Upper Thames Street, said he tried the Rothgiesser patent. It gave a splendid light, but used an enormous amount of water. He thought it his duty to inform the New River Company; and they at once gave him twelve hours' notice to take it off. He had to discontinue the use of the apparatus, after nine months' trial, because it was so unsatisfactory.

Mr. *Ernest Collins*, the Engineer of the New River Company, said the average pressure of the water supply was 30 to 35 lbs. to the square inch. He had considered the Rothgiesser patent, as someone from the Company came to him about it; and he told them the New River Company could not allow any direct attachment to the water supply, as it would be a very dangerous thing. The water would get contaminated with gas. He told them they could only attach it to a cistern.

Wednesday, July 3.

On the question whether certain answers to interrogatories were admissible as evidence,

Dr. *Huntley* stated that Mr. H. Greig, one of the defendants, had suffered from influenza, and was now of unsound mind and confined in a private home.

In cross-examination, he said he did not know that in 1900 Mr. Greig was defending an action brought against him by the Company. He recognized Mr. Greig's signature to the prospectus in 1898, when he was perfectly sane.

Mr. *Harry Greig*, son of defendant, corroborated Dr. Huntley, and said he attended to his father's litigation. The action by the Company was for calls on shares, as his father had been resisting payment. He could not say that his father was dissatisfied with the Company and its affairs.

Justice LAWRANCE came to the conclusion that the answers were not admissible as against Mr. Greig, because of his condition when he made them.

Mr. *James Swinburne* was then called on behalf of the plaintiff. He said the Welsbach Company asked him in 1897 to investigate the Rothgiesser patent. He did so, and came to the conclusion that it did not embody any new principle, or show any advance in lighting power; and that the apparatus was simply a clumsy injector. The whole thing appeared to him, as an engineer, to be obviously bad, and was neither ingenious nor useful. He examined it again in 1898, at the request of the Solicitors to the Company, and sent in an unfavourable report, which, of course, was not published. He did not expect that it would be.

Cross-examined: He did not know that the apparatus was installed for some time at the Welsbach Company's offices in York Street, Westminster, in 1898; nor did he see the circular they afterwards issued about the apparatus.

Mr. *Singleton*, a chartered accountant, said he was Liquidator of the defendant Company. He endeavoured to collect the amounts due from customers for apparatus supplied, but with very poor success. He had at present realized only £175 of assets, together with a German debt of 740 marks.

Mr. RAWLINSON, for the defendant Greig, then addressed the Jury, and submitted that there had been no fraudulent misrepresentation in the prospectus, or, if there was any misrepresentation, that the defendants had reasonable grounds for believing the statements to be true. Further than this, he said the plaintiff was not induced by the prospectus to subscribe for the shares, but used his own judgment after seeing the light on exhibition.

Mr. SHEARMAN, on behalf of the defendant Marler, suggested that the action was one of a disappointed speculator.

Mr. COMBE, for Sir W. Young, said his client had served his country with distinction as Governor of Hong Kong, Barbados, and Trinidad, and was not in any sense a "guinea pig." He honestly did his best for the Company, thinking the patent was a good thing; and after this experience, he had determined to have nothing more to do with company-promoting.

Mr. WELLS, the fourth defendant, addressed the Jury in person, and submitted that the prospectus was justified by the agreement entered into between the Company and the Welsbach Company. He said they were warranted in believing the apparatus was a valuable invention when the Welsbach Company took it up.

Mr. *Leopold Mayer*, a commission agent, was the first witness called for the defence by Mr. RAWLINSON. He said Mr. Vicars, the plaintiff, gave him an order for the shares, though he (witness) had never shown him any prospectus. Plaintiff took the shares entirely on witness's very warm recommendation.

Mr. *Myers*, of Messrs. Lumsden and Myers, brokers to the defendant Company, gave evidence as to the negotiations which ensued with the Welsbach Company before the prospectus was issued.

In cross-examination, he said he remembered that on June 22 a letter appeared in one of the financial papers from the Welsbach Company disclaiming any connection with the flotation of the defendant Company. The important fact was that the Welsbach Company had approved the technical statements in the prospectus.

Mr. *F. G. Gordon*, an electrical engineer, said that in 1898 he met Mr. Augspurg, Manager of the defendant Company. He saw the light on exhibition, and thought it the best gas-light he had ever seen.

Mr. *Frank Barber*, a Fulham draper, said he had had the light on his premises for more than two years. It was a very good one while it was looked after by the Company themselves. He had eight lights, and his water cost him £16 10s. a year. He thought it was the best light next to the electric light.

Cross-examined: The Water Company compelled him to put in a meter. He admitted that the cost of the light was excessive, and more than it was worth now, because the Company could not look after it, as they were in liquidation.

Mr. *C. Rossiter*, an engineer, said he ascribed the failure of the defendant Company to the fact that it was not properly pushed by the Welsbach Company. He had been employed by both Companies to make the apparatus.

Thursday, July 4.

On the resumption of the proceedings this morning,

Mr. *Sidney Marler*, one of the defendants, said that he was an estate agent, and a Director of Waring and Gillow, Limited. He attended several meetings of the Directors and promoters at the Solicitors' offices to discuss the prospectus, and made many inquiries as to whether all the statements in the prospectus were true in fact. He was assured on every hand that they were accurate; and he felt satisfied that the invention was a good thing. He saw the light on exhibition at the Welsbach Company's offices, and thought it was magnificent. He considered it was the light of the future, especially as a great concern like the Welsbach Company had taken it up. He particularly relied upon them and the statements made to him at their offices. It was only after he instituted all these inquiries that he joined the Board. He did not consent to go to allotment until the promoters agreed to take the whole of the purchase price in shares, as he thought the Company ought to have £10,000 of working capital. The Company failed because the Welsbach Company would not supply them with proper machines, and therefore the public refused to have anything to do with the light. He resigned his directorship in June, 1899, and lost £200 over the Company.

In cross-examination, he said he did not look at the specification of the patent, because it would have been "double Dutch" to him. He accepted what he saw and what was told him by the Welsbach Company. He left the matter of the agreements with the Welsbach Company entirely to the Solicitors, and thought he was justified in so doing. They advised the Directors that legally they were entitled to go to allotment. He made inquiries as to what the promoters paid for the patent, but never got any satisfactory answer. He knew the Welsbach Company had refused to give £50,000 for the patent; but this did not affect him in agreeing to give the promoters £180,000 for it. He knew that the Welsbach Company had disclaimed any interest in the promotion of the Company, and that afterwards applications for some thousands of shares were withdrawn.

Re-examined: The promoters paid the Welsbach Company £5000 in cash to get back the option to purchase for £50,000.

Sir *William Robinson*, G.C.M.G., said Mr. Grey asked him to be a Director of the defendant Company. He made inquiries before consenting to join the Board of Directors. He relied on the Solicitors for the preparation of the prospectus, and was satisfied that the statements it contained were accurate, from his own knowledge. He had repaid all the fees he received as Director, as they were accepted on the condition that they should be returned if the undertaking was not successful.

Cross-examined: The fees were repaid in September, 1900.

Mr. *G. T. Augspurg* said he was Manager of the defendant Company, and had been employed for some years by the Welsbach Company. He gave up his situation in the Company to join the defendant Company. Unfortunately, he had 90 per cent. enemies and 10 per cent. friends in the Welsbach Company. The appliances manufactured by the Company were badly made, and after three months they ceased manufacturing them by consent, and the defendant Company imported them from Germany at a cheaper rate. He attributed the failure of the defendant Company entirely to friction with the Welsbach Company, who apparently took up the Keith apparatus.

Cross-examined: Only 22 installations were fitted up, in addition to those made by the Welsbach Company, during the time the defendant Company was in existence as a working concern. The total received for installations during the whole eighteen months was £1244; and the amount the Company had to pay for them was £1248.

Mr. *Charles Wayland*, the Secretary of defendant Company, having given evidence,

Professor *Vivian B. Lewes* was called. He said he had for 25 years devoted himself to the study of various methods of lighting. He had seen the hydro-press light, and was greatly struck by it. It was superior to the electric light, because it was steadier. It was a pioneer invention, as in May, 1898, there was no other system of the kind known to the public, though several processes had since been introduced which were better and more economical. He agreed with the statements in the prospectus, that it was an ingenious, useful, and practical invention. Mr. Keith's system, he admitted, was far superior to the hydro-gas.

In cross-examination, he admitted that any expert seeing the patent in June, 1898, would have recognized that it was a very narrow one, and was not a master patent. The same result could be obtained in many other ways.

Mr. *Wells*, one of the promoters, stated that he did not desire to give any evidence.

Counsel then addressed the Jury, one of the main points of the defence being that the plaintiff subscribed for the shares as a speculation before he saw the prospectus at all.

Friday, July 5.

Justice LAWRANCE, in summing up, said the action as originally brought charged the defendants with making false and fraudulent misrepresentations in their prospectus; but this charge had now been withdrawn by plaintiff's Counsel. Plaintiff, however, said that the defendants issued the prospectus without having any reasonable ground for believing that the representations therein, or any of them, were true, and that they had issued it making certain statements which had not the sanction or authority of experts. He warned the Jury not to be led away by any quarrel that there might be between the defendant Company and the Welsbach Company, as this was not the point they had to try. They had nothing whatever to do with that. He remarked that the Company was formed only for the purpose of working a patent, and it was one which, like many others, was liable at any time to be superseded by something very much better. This was what had happened here; and the defendants' patent was probably worth very little now. The question was, What was the state of knowledge of the defendants at the time they issued the prospectus? It would not be a proper test to assume that the defendants knew at the time that the patent was worthless because it had afterwards turned out to be a failure. The questions he wished the Jury to answer were these: Was the prospectus issued with the authority of the defendants or any and which of them? Did the prospectus contain untrue statements? Had the defendants reasonable grounds at the time for believing that the statements were true? Did the plaintiff agree to take the shares, relying on the statements made in the prospectus? In some respects the last question ought to come first, as the defendants said the plaintiff subscribed for the shares as a speculation before he saw a prospectus, and that he did not rely on it at all. If that was so, then the other questions became unnecessary.

The Jury retired to consider their verdict. After an hour-and-a-quarter's consideration, they returned into Court, and answered the questions as follows: That the prospectus was issued with the authority of all the defendants; that it contained untrue statements; that the defendants had reasonable grounds for believing, at the time of the allotment of shares, that the statements were true; and that the plaintiff agreed to take the shares relying on the statements in the prospectus.

Justice LAWRANCE said that was a verdict for the defendants. He therefore gave judgment in favour of all the defendants, with costs.

Stay of execution was refused.

HIGH COURT OF JUSTICE OF IRELAND—CHANCERY DIVISION.

Tuesday, July 2.

(*Before the* MASTER OF THE ROLLS.)

Welsbach Incandescent Gaslight Company v. M'Grady and Co.

This was a motion by the plaintiffs that the trial of the action be adjourned from these to the next October sittings.

Mr. W. G. JEFFERSON said the action was for an injunction to restrain the defendants from manufacturing, selling, or otherwise infringing the plaintiff Company's patent for improvements in incandescent burners. It would be necessary to examine a large number of experts residing in England and Germany. The defence was a traverse of the patent, and that the patent was not a new invention. Two other actions were pending in England, which would decide the validity of the patent, and were really test actions. The defences in these cases, in fact, went even farther than that of the defendants here. Whether here or in England, it was necessary to call a large number of expert witnesses both from England and from Germany; and these witnesses would also be needed in the Irish action. When the notice of trial was served, it was thought that the English actions were not going on; but so soon as it was found that this was a mistake, the plaintiffs wished to adjourn this action. The trials could not go on in England and Ireland at the same time; and as there had been no interlocutory injunction, no damage would be done defendants.

Mr. R. M'ILROY, who appeared for the defendants, complained that the plaintiff Company had been scattering writs among small shopkeepers in the North of Ireland. The chief defendant in the present case was a small shopkeeper in Belfast. The plaintiffs served notice of trial for last sittings, but did not set down the action for hearing. Then they served notice for the present sittings, and the same thing happened. They were keeping the action hanging over his clients; and under the circumstances he thought they might be put under some terms in order to get rid of the action.

Mr. JEFFERSON said he would undertake to go to trial at the beginning of next sittings.

The MASTER OF THE ROLLS did not think it would do defendants

any harm to allow the case to stand over, as there was no injunction. He would grant the adjournment—plaintiffs undertaking to set the action down for trial on the first cause day of next sittings, and pay the costs of the present application.

GREENWICH POLICE COURT.—Tuesday, July 2.

(*Before Mr.* C. E. T. D'EYNCOURT.)

Lewisham Borough Council v. Crystal Palace District Gas Company—An Alleged Purification Nuisance.

The Crystal Palace District Gas Company appeared to-day in answer to six summonses issued at the instance of the Lewisham Borough Council for carrying on an offensive "trade, business, process, or manufacture," and causing effluvia, which was a nuisance, on April 26, 27, 29, 30, and May 4 and 10.

Mr. R. MUIR (instructed by Messrs. Young, Son, and Ward) represented the Council; Mr. RYDE (instructed by Messrs. Blyth, Dutton, Hartley, and Blyth) appeared for the Company.

Mr. MUIR said the summonses (which it had been agreed should be heard together) were taken out against the Gas Company and their Secretary (Mr. Charles M. Ohren), under section 21 of the Public Health (London) Act of 1891, the material words of which were:

Where any manufactory, building, or premises used for any trade, business, process, or manufacture, causing effluvia, is certified to the sanitary authority by their Medical Officer of Health or by two legally qualified medical practitioners, or by ten inhabitants of the district of such authority [the certificate in this case was by ten inhabitants, and there was also a certificate by their Medical Officer of Health], to be a nuisance or injurious or dangerous to the health of the inhabitants of the district, such authority shall make a complaint . . . and if it appears the trade, business, process, or manufacture carried on by the person complained of is a nuisance, or causes any effluvia which is [according to the statute] a nuisance or injurious to the health of any of the inhabitants of the district, then, unless it is shown that such person has used the best practicable means for abating the nuisance, the person so offending (being the owner or occupier of the premises, or being the foreman or other person, employed by such owner or occupier) shall be liable to a fine not exceeding £50.

The proceeding therefore would be for him (Mr. Muir) to establish that there was a nuisance, and then it would be for the defendants to show they had used all practicable means to abate it.

Mr. D'EYNCOURT: You do not say it is injurious to health?

Mr. MUIR: No, Sir. Continuing, he said that formerly the gas manufactured at these works was coal gas only. But within recent years the manufacture of water gas had been instituted; and it was asserted by witnesses who had been inhabitants for many years, that they had noticed quite a different smell within the last two or three years. This smell was so bad that it not only nauseated them by its odour, but could actually be tasted in their mouths. An oily substance, too, was deposited on their vegetation, and in water stagnant in their gardens. Persons in the neighbourhood—some of them a considerable distance from the works—had their habitations rendered unendurable at certain times. There was no doubt about it that the process that caused these stenches was the clearing out of the purifiers. The exhausted product, too, was carted about the neighbourhood in a very careless way; and he was informed that the result was an abominable stench. An occupier of a house a quarter of a mile away would be called who would say that, when the wind was blowing in his direction, the premises were unendurable; and other witnesses would be called who would speak of the abominable nature of the stenches caused by the gas-works. It would then be for the defendants to show they had used every practicable means for abating the nuisance.

Mr. RYDE remarked that, after they had heard the plaintiffs' evidence, by way of self-defence, he might have to ask for an adjournment, to get the necessary statistics as to what occurred on certain dates.

Mr. MUIR said there would be no difficulty about that.

Mr. *George W. Beste*, of 93, Perry Hill, Catford, was the first witness. He said his house was about 400 yards from the gas-works. Prior to the last two years, he had noticed smells from the works, but not of the character he had experienced during the last two years. It was rather difficult to describe the smell; but it appeared to him to have the odour of rotten eggs. One morning on leaving his house, it caught his breath like the fumes of a coke fire. He had noticed an oily deposit on water in the garden—especially in the fowl troughs. He had also observed that some of the plants had been affected the last year or two; and he had attributed it to this. A lot of the foliage had decayed prematurely. He only suffered when the wind was due south. The smell was undoubtedly a nuisance, and such a one that he would have to leave his house if it was not abated.

Cross-examined by Mr. RYDE: He had not taken any particular note of the dates when he had suffered from the smell; but he could speak to the 19th of April—the date of his first letter of complaint to the Local Authority. The smell was exceptionally bad on that day. It was also bad the previous day (July 1)—certainly in the afternoon and evening. The smell was undoubtedly worse when there was a quiet wind; and when the air was heavy—damp and saturated with moisture. The smell, as he had already said, was of the odour of rotten eggs; and he believed sulphuretted hydrogen had a smell akin to that. Asked whether he attributed the smell to water gas, he replied only inasmuch as he had only noticed it since water gas was first used by the Company. He could not give a precise date when the nuisance commenced; but it was certainly as far back as eighteen months. As to the oily deposit, it had the appearance of paraffin which had been poured on water and floated on the surface. He noticed it more particularly in the winter than in the summer months. The smell did not go on continuously; it varied with the wind.

Mr. D'EYNCOURT asked Mr. Ryde whether, under the sub-section of the section quoted by Mr. Muir, the Company were prepared to do anything further.

Mr. RYDE answered that it was not a question of expense with the Company. They believed they had adopted the most modern and effective appliances. They were, in fact, doing all that science could help them do. In the course of further discussion, he said the evidence had taken them by surprise. They expected it would refer to ordinary coal gas, not to water gas, for the simple reason that sulphuretted hydrogen did not arise from water gas at all, because it was not there. This might possibly be a new point which his experts would like to consider. The suggestion that it came from the water gas was quite a mistake.

Mr. *Roland Brangwin*, of 77, Perry Hill, Catford, gave the distance of his house as about 500 yards from the works. He also had noticed a change in the smells from the works, and declared that during the last eighteen months or two years the stench had been most offensive. The smell had been acrid and distasteful. One morning he remarked to his wife that it almost made him inclined to "bring up" his breakfast. He had not noticed any effect on his garden; but he had observed a film on the pavement when it was damp.

In cross-examination, witness said the paving was of stone. He did not think he had made a complaint direct to the Gas Company. He did not notice the smell constantly, but frequently. His residence in the district extended over fifteen years; and the smell was worse now than several years ago. Undoubtedly, the smell was worse in his house when the wind was in the south; but he had observed it in other parts of the district.

Mr. *Thomas Asplin*, who had resided at 69, Perry Hill, for 21 years, practically agreed with the statements of the two previous witnesses.

In cross-examination, witness admitted that there had always been some sort of smell from the gas-works; but formerly they rather liked it. (Laughter.)

Mr. *E. Evans Leach*, who had occupied Laurel Brook, Castlands Lane, for 45 years, recollected the gas-works in their infancy. He likewise testified there had been a great change for the worse in the smell during the last two years. He did not like to speak positively as to the effect on the vegetation in his garden; but his plum trees had lately died off. However, the smell he characterized as a perfect nuisance, and said he feared as a large property owner in the neighbourhood, he would suffer in pocket.

Cross-examined: There were a good many trees in the neighbourhood doing very badly. The elm trees particularly were dying off, and had certainly done so within the last year or two. He had lost half-a-dozen round about his house—trees that had stood there a length of time. He had had to replace his plum trees in several instances. Whenever the wind came from the direction of the gas-works, they had the smell at his house. It was so bad sometimes that they could not really open the doors. He could not say which part of the works the smell came from. Questioned whether, as a property owner in the neighbourhood, rents had gone down, he instanced a house which used to obtain a rental of £150 and now only let for £100. Mr. Beste (the first witness) was a tenant of his; and he had told him he should not stay in the house if the smell continued.

Mr. *J. Buller*, of 2, Croft Terrace, Bell Green, also deposed that the smell from the works had been different within the last eighteen months or two years. It had, in fact, been very bad. Before then, having got used to it, he did not object to the smell. He also described the odour as being like rotten eggs. He had seen the material that was carted away from the purifiers; and the smell it emitted was the same as came from the gas-works.

In cross-examination, the witness said he could not give any particular date on which he had noticed the smell; but he imagined it happened roughly three or four times a week, lasting each time about three or four hours.

By his WORSHIP: His own health had not suffered; and he had lived in the neighbourhood of the works 35 years.

Mr. *Sydney Blake Jolly*, Acting Medical Officer of Health, said he had visited the works on three occasions. The first time was on April 30, when a water-gas purifier had been opened. The smell was most extraordinary; and he really could not describe it exactly. He had had breakfast at the time; but, in spite of this, he could taste the smell in his mouth the whole of the morning. The smell came from the lime. His second visit was on May 4. A water-gas purifier was being cleaned out, and there was again an extraordinary smell. There was a certain amount of sulphuretted hydrogen about; but the smell seemed to him to be ammoniacal. [Mr. MUIR suggested demoniacal would be a better expression.] On witness's third visit (May 10), a coal-gas purifier was being cleaned out; and on this occasion "the smell was the worst of the lot." On April 30, when the water-gas purifier was being emptied, he could smell it about 300 yards from the works; when the coal-gas purifier was being cleaned out, he could smell it all the way up the Sydenham Road. The smells were quite distinct. From the water-gas purifier, it was suffocating; and from the coal gas it was absolutely offensive. Samples of the solids and gases were taken, and sent to the Analyst. He had noticed the smell a quarter of a mile off when driving about.

In cross-examination, witness affirmed that the smell he noticed on May 4 was the same as on April 30; but it was not the same as on May 10. On the last date, the smell was more like sulphuretted hydrogen.

Mr. RYDE remarked that that was what astonished them. They were prepared to find there was a smell from the coal-gas purifiers, but not from the water gas.

Further questioned, witness stated that, on his visits, the Company's officials did not put a check on him in any way.

In answer to Mr. D'EYNCOURT, he said he did not think the health of the neighbourhood suffered; it might in some instances.

Mr. *E. T. Pidwell*, one of the plaintiffs' sanitary inspectors, stated that he had the gas-works under observation from April 23 to 25; but he noticed nothing particularly offensive on either of these days. Spent lime was being carted through the district; but there was nothing to complain about—the carts then being covered with sacking and tarpaulin. On April 26, he saw a purifier emptied. A valve was unscrewed, and a stream of white vapour came out; and then there were most disgusting effluvia. When the cover was raised, the men took out the spent lime; and every time it was disturbed, there was the white vapour. During the whole process, there were most offensive effluvia. The spent lime was put into a railway truck; and during the time he was keeping observation—two to two-and-a-half hours—

it was left uncovered. The operation of cleansing the purifier was not completed then. The smell hung about Bell Green more or less the whole day. On April 29, he entered the works in company with a colleague—Inspector Knappett. There was then a most offensive smell, which he found emanated from two uncovered railway trucks of blue billy. The odour from the water-gas purifier on April 30 was quite different from the other. The smell from the coal-gas purifier was very disgusting; but it had not the nauseating effect that that from the water-gas purifier had. Witness gave similar evidence in regard to May 4 and 10.

Cross-examined: On April 22, 23, 24, and 25, he did not notice any smell that could be called a nuisance. On two distinct occasions, he had seen carts containing spent lime outside the works uncovered. For instance, on May 10, the carts were not covered. He had noticed smells from the works for some years past; but on April 26 it was particularly bad. He could not suggest any way of clearing out a purifier other than discharging it into trucks or on to the ground. To his knowledge, there was not a manure depôt belonging to the Local Authority between the works and Castlands Lane. He denied that on May 4 he said to one of the Company's men, "I cannot see much to complain about." There was then foul gas or matter emanating from the spent lime. He believed a foreman named Malster did volunteer something about the lime containing carbonic acid.

Mr. *B. A. Knappett*, another Sanitary Inspector, corroborated the last witness's evidence; and, in cross-examination, he said he did not suggest there was any bad management in clearing out the purifiers, nor could he offer any proposal for improvement.

This was the case for the plaintiffs.

Mr. RYDE, referring to a remark by his Worship, said the Company were using, so far as they knew, the most modern system of purification. They were bound to purify by statute; and they used the most effective means they could imagine. If any suggestion could be made by which they could improve it, they would undoubtedly adopt it.

The further hearing was adjourned.

CORK POLICE OFFICE.—Tuesday, July 2.

(*Before the* LORD MAYOR *and Messrs.* MAYNE, COLE, *and* FARRINGTON.)

The Prosecution of Gas Workers.

To-day the Lord Mayor of Cork (Alderman E. Fitzgerald) and the above-named Magistrates resumed the hearing of the charges against certain workmen employed by the Gas Company for breach of contract. When the cases were last before the Court, they were adjourned for the purpose of procuring information as to the terms of contracts between gas workers and gas companies in England and Ireland.

Mr. G. LAWRENCE appeared for the Company; Mr. B. C. GALVIN represented the defendants.

Mr. LAWRENCE said that since he was before the Magistrates on the last occasion he had carefully considered the suggestion that evidence should be given of the particulars of contracts in other places. He had consulted authorities on the subject, and had come to the conclusion that if he were to tender to the Magistrates evidence of such particulars they would vitiate any decision they might come to. There was nothing clearer, especially in criminal law, than that the evidence must be particular in its application; and the point to be decided was: What was the contract between the accused men and the Gas Company, and was that contract broken by the acts of the men? If they imported into the matter particulars of contracts between other men and other companies, it would be a clear violation of the criminal law. Even if there was a decision in his favour, he would destroy it by introducing illegal evidence, because it had been held that, even where there was abundant legal evidence for a conviction, the decision was vitiated by the introduction of a trivial amount of illegal evidence. With the utmost desire on his part to defer to any suggestion of the Magistrates, he was unable, on behalf of his clients, to put such evidence before them as they asked for.

Mr. GALVIN said that when this question of legal or illegal evidence was mentioned, he unhesitatingly undertook to admit it. He did not know, at the time, what the evidence might be; and at the moment he was unaware of what it was. It was stated in Court on the last occasion that communications had taken place between some of the centres in England and in Ireland, and that replies had been received. He did not know what these replies were; but he only made one stipulation in regard to them—namely, that the various letters should be admitted, provided he was allowed to read the report of the proceedings against the men at Tyldesley and the result. He now claimed that he was entitled to read the report.

Mr. LAWRENCE said he had abstained from inquiring what were the replies which had been received, because he wished to confine his attention to the legal questions. As a lawyer, he had come to the conclusion that he would be doing an injustice to the Magistrates, and putting them in a false position, if he did not inform them what his opinion was.

Mr. GALVIN said he proposed to read the report of the proceedings at Tyldesley.

Mr. LAWRENCE said his friend wished to open up the whole question again. If he had any desire to argue the case, or cite authority from any document or any paper which the Justices considered reliable, he had no objection, and only asked for the right of reply.

The LORD MAYOR remarked that on the previous occasion the Company undertook to supply the information.

Mr. LAWRENCE: I was not here on the last day.

The LORD MAYOR expressed the opinion that the case had been met in a very generous spirit, and no desire of taking advantage had been shown on any hand; but he was under the impression that Mr. Mahony undertook to supply the information.

Mr. LAWRENCE did not deny the statement, but pointed out that under no circumstances could the Magistrates take into consideration the question of contracts elsewhere.

The LORD MAYOR said it was only fair that they should hear both sides. It had been distinctly admitted in open Court that, the more information they could get, the better position they would be in to decide.

Mr. LAWRENCE: If any circumstances of that kind are taken into consideration, it will be under protest from me.

Mr. GALVIN pressed that the report should be received.

All the Magistrates, except the Lord Mayor, were opposed to this course; and, in the result, it was not admitted. The Magistrates then retired to confer; and, after three-quarters of an hour's deliberation, returned into Court.

Mr. MAYNE, in giving their decision, said: While the Bench are perfectly unanimous in again expressing their opinion that the men acted extremely badly on this occasion, we are not quite satisfied that there existed a clear and satisfactory agreement, the breaking of which would subject the defendants to a severe punishment. We, therefore, after very long consideration, cannot unanimously agree to convict or dismiss the case. Giving the benefit of the doubt to the two men, the case is dismissed, without prejudice.

Mr. GALVIN said the same ruling would, of course, apply to the other cases.

Mr. MAYNE acquiesced.

Mr. LAWRENCE agreed to this course.

The proceedings then ended.

Cleckheaton Gas-Works.—These works, which belong to the Urban District Council, realized a profit of £2397 18s. during the past year, as compared with £3482 3s. in the preceding twelve months. The average cost of coal was 4s. per ton higher than in the year 1899-1900, which added £1700 to the working expenses.

Gomersal Gas Company.—The annual meeting of this Company was held yesterday week. The balance-sheet showed a net profit of £1026 for the year, and the maximum dividends of 10, 7, and 5 per cent. were declared. A vote of thanks was accorded to Mr. H. Niven, the Engineer, who is leaving for a public appointment in Lancashire.

Water-Works for Wyvenhoe.—At a recent special meeting, the Wyvenhoe Urban District Council affixed their seal to the contract with Mr. Henry Shardlow, of Nottingham, for carrying out the new water-works scheme for £6282; the specified time for its completion being ten months, and the penalty £10 for each week in excess of that time. Mr. Hill, of Deal, has been appointed Clerk of the Works.

Public Lighting of Chard.—At a meeting last Thursday, the Chard Town Council decided to enter into a new agreement with the Gas Company for the lighting of the town for the ensuing three years. The whole of the thoroughfares are to be lighted by gas—the oil-lamps in use in some of the outlying streets being abolished; and incandescent burners are to be fitted to all the lamps. A Committee had considered the question of lighting the town by electricity, and advised the Council not to adopt it.

Weston-super-Mare Gas Bill.—In its progress through the House of Lords, the Bill of the Weston-super-Mare Gas Company underwent some alteration; and it was therefore necessary that the revised Bill should be approved by the shareholders before it entered the Commons. They held a meeting for the purpose a few days since, when the Chairman (Mr. Hans F. Price) mentioned that one of the clauses conferred upon the Local Authority the right to purchase the works within five years from the passing of the Act. He did not think it was likely the Corporation would take advantage of the clause. A resolution in the usual terms was passed.

Ossett Gas-Works Transfer.—The formal ceremony of the taking over, by the Corporation, of the Ossett Gas Company's works took place on Monday night last week. A procession, consisting of the members of the Council and officials, headed by the Ossett brass band, started from the Technical School. On arriving at the gas-works, the Mayor (Mr. Walter Townend) presented a gold key to Alderman Audsley, the Chairman of the Gas Committee, as a token of appreciation of his services on the purchase question. The latter said he thought a fair bargain had been made, and expressed the hope that the acquisition of the undertaking would prove a blessing to the town. Alderman Audsley then opened the door, and an inspection was made of the premises. The actual transfer of the works took place on the previous Saturday, when representatives of the Corporation attended at the Company's offices to pay the amount fixed by arbitration—£97,500—together with £225 for the Company's winding-up expenses, £1636 5s. 10d. for a half-year's dividend, and £178 10s. 5d., being half the cash in hand (in addition to the reserve fund of £4000 in Consols on March 14, 1900); making a total of £99,539 16s. 3d.

Matlock Urban District Council and the Gas-Works.—At the meeting of the Matlock Urban District Council on Monday last week, a petition was presented from the owners and ratepayers of the Starkholmes district praying the Council to enforce the provisions of the Matlock Bath Gas Act, 1896, referring to the removal of the gas-works from the district. A further petition was read from the Matlock Ratepayers' and Owners' Association Committee to the same effect. They pointed out that the provisions referred to should come into force within three years from now, and to sanction any extension of the present works (as had been decided by Matlock Bath) would probably be a waiver of the rights of Matlock under the Act. It was proved in evidence before the House of Commons Committee that the works were a nuisance to the district, and they therefore asked the Council not to sanction any extension of them, approve of any plans, or otherwise countenance such a scheme. The Chairman (Mr. J. Smith) said there seemed to be a great deal of feeling in the district about this question. The Council had no alternative but to pass the plans sent in by the Matlock Bath Council for the extension of their works. The Council spent £800 in getting the proviso for the removal of the works inserted, and in protecting their rights in other directions before Parliament; and they felt the position somewhat keenly. The great plea of the Bath Council was that the works were a nuisance; and, taking this into consideration, it was rather surprising to find they desired to extend them. However, the plans had been adopted, and if Matlock Bath wished to spend £10,000 on their works, and yet have to move them next week, the Council could not say anything. The matter then dropped.

MISCELLANEOUS NEWS.

THE RESIGNATION OF SIR A. R. BINNIE.

At the Meeting of the London County Council last Tuesday, the General Purposes Committee reported the receipt of a letter from Sir A. R. Binnie, the Chief Engineer to the Council, relinquishing his office. The matter was referred to last week. The writer stated that his reason for desiring to resign was that he wished to enter upon the private practice of his profession—a course incompatible with his present official position. He expressed his desire to consult the interests of the Council as to the exact time at which his resignation should take effect, and to do nothing hastily, or in a manner which would prejudice the public service. He asked that his sincere thanks might be conveyed to the members of the Council generally for the great kindness, courtesy, and consideration he had at all times received at their hands since his appointment in 1890. The Committee, in recommending that the resignation be accepted, to take effect on the 31st of December next, stated that during the eleven years Sir Alexander Binnie had held his appointment, large and important undertakings, including the Blackwall Tunnel, had been carried out. In these works, and also in connection with schemes before Committees of the two Houses of Parliament and before the Royal Commission on Water Supply and other inquiries, he had shown such great ability, and had rendered such valuable services, that they felt sure the Council would unanimously agree with them that the severance of his connection with the Council would be a great loss to the service, and that the intimation of the resignation of the important office which he had filled with such marked success would be received with great and sincere regret. As regarded the date when the resignation should take effect, they thought it very desirable the Council should have the advantage of Sir Alexander's services until the end of the year; and they understood that he was willing to fall in with this proposal. The Chairman of the Committee (Mr. J. M'Dougall) moved the adoption of the report, and expressed regret at the resignation of the Chief Engineer. He referred to the important works carried out under Sir Alexander Binnie, including the Blackwall and Rotherhithe Tunnels. Alderman Beachcroft said it would be difficult to replace Sir A. Binnie, whose masterly statement before the Parliamentary Committee on Underground Railways had struck everyone. After other eulogistic expressions, Mr. Dickinson said he thought it was a great pity the Parliamentary Committees and Royal Commissions had not accepted the Chief Engineer's views as to the water question, when he told them that the Council should be the water authority. This opinion would prevail in course of time. The Hon. W. R. Peel, M.P., associated himself with the regrets which had been expressed, but dissented entirely from the remarks of Mr. Dickinson on the water question, which were, in his opinion, in bad taste. The report was adopted.

MR. LONG ON THE LONDON WATER QUESTION.

The President of the Local Government Board (Mr. W. H. Long) was present at a complimentary banquet given at the Café Monico, last Wednesday, by the Limehouse, Ratcliff, and Shadwell Constitutional Association, to Mr. Harry S. Samuel, M.P., who represents the constituency, and, in responding to the toast of "His Majesty's Government," delivered an important pronouncement on the London Water Question. Speaking of the subjects with which the Government had to deal, he said that among them was the vexed and long-fought one of the water supply of the Metropolis. He had himself examined this question very carefully, and he thought the London County Council had much to answer for in regard to the postponement of its settlement. Yet he did not blame them altogether for the action they had taken. They, at all events, had the merit of having moved in the matter when others were unwilling to act. They had moved with vigour, though he regarded it as misdirected vigour. Had they only realized the magnitude of this water question, he thought it might have been settled long ago. But, whether he read the history of the past rightly or wrongly, the present position was unmistakable. The Government had successfully resisted one Bill after another. These Bills had been rejected by the House of Commons in the belief that they were not calculated rightly and justly to do the work which it was necessary to do. Could that state of things be allowed to continue? Was it not absolutely necessary that they should now deal with, and solve, this problem—in an equitable and generous spirit if they liked, but in such a manner as would make it a final settlement? They wanted a body of weight and importance which should control the whole of the water supply of London—a body elected in such a manner that it should be fairly and justly representative of all the interests of the population, and of the rateable value which it would have to control. They wanted it to be endowed with power sufficient for the work which it would have to do; and they wanted, above all, that it should be so constituted that any legislative interference would be unnecessary for many a day to come. Was the task so difficult? No. The task, so far as concerned the production of a scheme which would answer those requirements, was comparatively easy. But there was the difficulty that each of the various interests concerned seemed at the present moment to be asking for a monopoly of that power in itself. Now, there must be mutual concessions—give and take—if they were going to deal with this question. Speaking for himself, as the Minister responsible, and also for the Government, it was their intention next session to introduce a Bill which they believed would answer the requirements he had laid down; and they purposed to do their utmost to carry that Bill, and place it upon the statute-book. It might be that some of those affected would stand out. He hoped they would not. He trusted they would find in the Government measure reasonable provision for their requirements; but if, here or there, some particular interests resisted this inevitable reform, then he ventured to say that they would have to give way to superior forces, and the measure would have to be carried in spite of them. He believed that this question, long though it had been fought, could be dealt with satisfactorily; and all he asked for was that London would meet him in a generous spirit, and help him and the Government to carry the measure. He asked further that the outside areas should realize that, as in all provincial cases where such areas had fought hard, they must bow to superior force. The Government did not ask the outside areas to sacrifice themselves in the interests of London; but it asked them to realize the enormous benefits which the fringe surrounding the Metropolis derived from its proximity, and to recognize that those advantages carried with them responsibilities. If London and the outside areas would weigh all the facts, he believed they would be able to settle the question definitely and for all time, without any great friction or any insuperable difficulty.

COAL CONTRACTS AT STOCKTON.

A little unpleasantness was caused by Mr. Meggeson on the subject of the coal contracts at the meeting of the Stockton Town Council last Tuesday. He said that a month ago the Gas Committee were recommended to get tenders for from 25,000 to 30,000 tons of coal for the manufacture of gas. The tenders were obtained and opened, and presented to the Gas Committee. The matter was left over in order that the Manager might make a report on the quality, and recommend to another meeting. That meeting was held that evening; and they were met by the startling information that the Manager had been writing to some of the colliery firms, and they had undertaken to reduce the price 3d. per ton. As a member of the Town Council, he could not allow a thing like that. It was not straight business; and, if it were not corruption, he did not know what it was. He moved that the contracts be referred back; and Mr. Trattles seconded. Alderman Richardson roused the ire of Mr. Meggeson by a reference to his inexperience. If Mr. Ford was not an official to be trusted, it was time that they all retired, Committee as well. Personally, he might say that his firm did not care whether they obtained the contract or not. Mr. Tomkins remarked that the Council would be saving a considerable amount on the contracts. Alderman Bainbridge denied there had been corruption. Mr. Hodgson complained that the discussion had sunk to a level below that which usually dignified the Chamber, and said that, if the charges were true, the officials should be discharged at once; but they could not tolerate unfounded charges. Mr. Meggeson rose excitedly and demanded the withdrawal of the remark that there was no foundation for the charges. Mr. Hodgson said he was entitled to his opinion; and he reiterated that the charges were utterly unfounded. He added that they would not have their officials bullied and coerced. Alderman Samuel said he would not vote for the amendment; but if they were to uphold the purity of public life, they must give all persons who tendered fair play, and the tenders should be secret. If they were to be revised, then everyone should have the same opportunity of sending in lower prices. Eventually the amendment was rejected; only three voting for it, and 18 against.

ELECTRIC LIGHTING NOTES.

Last Tuesday, the Mayor of Lewes (Mr. G. Holman) performed the ceremony of switching on current to the town from the works which have been put up by the Electrical Power Distribution Company for the supply of electricity.

The Board of Trade have refused a request of the Limerick Town Council to allow their Electric Lighting Provisional Order, 1892, to remain in force for five years from Nov. 9 next. But with a view of giving the undertakers full opportunity of exercising their powers, the Board have consented to defer consideration of the question of revocation for one year. Then they will require to be furnished with evidence of a *bonâ fide* intention of proceeding with the Order.

In connection with a report on the subject of electric tramways, which was considered by the Torquay Town Council last Tuesday, it was stated that in a short time the question of a new electric light station would have to come up. The Mayor (Mr. W. Ball, jun.) expressed the opinion that the site was unfortunately chosen, and said that before long all the machinery they could cram into it would be fully employed. This was urged as one of several reasons for deferring the tramway scheme; and it was successful to the extent that the subject was referred back to the Committee.

At last the Cardiff Corporation Electric Lighting Committee are able to nearly show a profit; and by a little twisting of the figures they actually do show that the concern is now a paying one. In the preceding year, there was a loss of £1700. Last year, after paying £4187 interest and sinking fund and all expenses, there is a loss of £75 19s. 3d. But the Committee say they have paid £97 10s. on account of repairs to a Ferranti engine, in regard to which they had £1056 in hand. Thus, they say, the department made a profit of £21 10s. 9d. This is really rather amusing, and not exactly clever.

The Norwich City Council are considering the question of purchasing the local electric lighting works; and they are being advised by Mr. C. Hawtayne, who appears to have a strong proclivity for municipalization. A local paper has been fortified with figures as to the "profits" made by municipal electric light undertakings in towns far superior in importance to Norwich from the business point of view. This is unfair; but it will no doubt have some influence with the ratepayers. The Kitson light is just now undergoing trial in the Market Place; and the same local paper speaks highly of its performance. Will this light be strong enough to stay the hand of the Corporation? If it is, it will be a feather in the cap of the Kitson Syndicate.

The Leeds City Council adopted last Wednesday a resolution submitted by Alderman Wigram to the effect that, on and after the 1st of October next, the prices of electrical energy supplied by the Corporation should be reduced in accordance with the recommendation of the Lighting Committee. He said they proposed that the maximum price of energy for lighting purposes should be 4d. per unit. This would commend itself to the Council, for the smallest user would get

the largest proportionate benefit. The next suggestion was tentative. It was that the price of energy used in motors should be based upon the number of units consumed per horse power, and should range from 2d. to 1½d. per unit, according to the rate at which each horse power ran. If they found the scheme did not work well, they might have to come back to the Council and confess that they had made a mistake; but he hoped they would not have to do so.

The members of the Teignmouth District Council found themselves in a rather difficult position last week. After having gone to the expense of obtaining a Provisional Order, they decided a month ago to leave electric lighting alone; and they seemed quite pleased to have done with the matter. Last Tuesday they learnt, to the disgust of some of their number, that a private Company are about to step into the vacant position; the Provincial Electric Supply and Traction Company having given notice of their intention to apply for powers to supply electricity in the town. The Clerk suggested that the Council "should do something;" but the members, though they made wry faces over it, did not see the use of spending money in opposing the application when they are not prepared themselves to undertake electric lighting. From the Council's point of view, the worst of an electric lighting undertaking in private hands is that it will be a rival to the gas-works, which the Council have not found very profitable

A report on the first year's working of the York Corporation electric lighting undertaking has just been issued by the Engineer, Mr. C. A. Midgley. It states that, after payment of all out-goings, including interest and sinking fund, and also discharging a debt of £310 19s. 6d. incurred in preliminary expenses, there is a net profit of rather under £100. The year, Mr. Midgley says, has been a phenomenal one, and has created a record which has never been equalled by any provincial station in its first year. Originally Professor Kennedy installed four engines and dynamos, with a total horse power of 320. With this plant the Corporation were in a position to supply 6000 lamps of 8-candle power, burning simultaneously. So great was the demand, however, that a 400-horse power engine and dynamo had to be installed for the past winter. This No. 5 set was itself capable of supplying 7000 8-candle power lamps. But even with this set, they had not been able to have one of the others laid off; and at the end of the year (March 31 last), they had a total lamp connection of 16,400 and above 5000 applied for, the majority of which would be connected up by the end of July. Further expense on mains and extensions for the coming winter to the amount of £10,850 is considered absolutely necessary by the Engineer. The report was before the City Council on the 1st inst.; and, in addition to its adoption, it was decided to make application to the Local Government Board for sanction to borrow £10,850 for mains and extensions.

The members of the Electricity Committee of the Manchester Corporation made an inspection last Thursday of the generating stations, some of the sub-stations, and the street mains connected with the supply of the electric current for tramway traction and lighting purposes. Under the guidance of Dr. Bishop, Chairman of the Committee, Mr. Hesketh, Chairman of the Street Mains Sub-Committee, and Mr. G. F. Metzger, the Chief Engineer, the party first visited the generating station in Dickinson Street. At this station there is a total of 13,000-horse power, obtained from engines varying from 400 to 3000 horse power. There are two engines, each of 1500-horse power, in use for tramway purposes only; but they are so arranged that the dynamos they drive can, in case of emergency, be also utilized for lighting, and a special switchboard for equalizing purposes has been erected to make this possible. There is also fitted here the three-phase machinery required for supplying the outside districts for the purposes of lighting and power. Under a pressure of 5000 volts, the current is conveyed to the sub-stations, where the pressure is reduced to that required for supplying consumers. An idea of the capacity of the works at Dickinson Street may be gained from the statement that the boiler-houses are eight in number, and that there are 22 boilers. All are stoked automatically. At the end of last year the number of 8-candle lamps in use was 367,000, and only with difficulty could steam be maintained and current supplied. Since then 13,000 additional lamps have been installed, and the tram routes opened. The returns made up for the Committee show that the quantity of current generated at the Dickinson Street station during the year ended March 31 last was larger than that obtained from any other municipal electric supply scheme. The Bloom Street station, which was next visited, is being finished as quickly as possible; and it is hoped that it will be available for the production of electrical energy by September. This station will be equipped with four 3500-horse power engines and generators, with proper boilers, economizers, switchboards, &c. The total capacity when finished will be 14,000-horse power. As regards the great works at Stuart Street, as a first instalment there will be fitted up machinery of 15,000-horse power. In a comparatively short time it is intended to increase this capacity to 60,000-horse power. After inspecting the works at Bloom Street, the party went to the stores and workshops at the Polygon, Ardwick. The buildings, which cover an area of 7760 square yards, are nearly finished. Offices for the department have been built, and there is also a sub-station for supplying the district with electricity. The total length of mains laid up to March 31 was 159¼ miles, at an expenditure in Manchester of £422,111, in Withington of £38,487, in Moss Side of £18,804, and in Levenshulme of £2630; making a total of more than £482,000. The quantity of electricity measured and accounted for during the past year was 7,944,540 units. There are at present on the books 3786 consumers; and the total maximum demand is equivalent to 386,770 8-candle lamps.

The abstract of the accounts of the various trading concerns of the city of Hull for the year ending March 31 has been issued. It shows that the water-works made a clear profit of £10,226, of which £7000 will go to the relief of the rates. The gas supply, the paying possibilities of which many questioned when it was bought, realized a gross profit of £4580; the net credit balance being £931 on the year. Electric light, too, returned a profit; £1228 being added to the reserve. The city has £169,979 invested in the electric supply; and the gross income from users is £24,574.

PLYMOUTH CORPORATION WATER SUPPLY.

Position of the Undertaking and Policy of the Committee.

The Corporation of Plymouth paid their annual visit to the water-works, and held "Ye Fyshinge Feaste," last Wednesday. At the dinner, at which the Mayor (Mr. R. Risdon) presided, Alderman J. T. Bond, Chairman of the Water Committee, spoke at some length of the position of the undertaking and the policy of the Committee. The water question, he said, divided itself into three phases. The first and most vital was the provision of a storage reservoir, which had been well and faithfully done; the second was to review the revenue-producing power of the undertaking; and the third was to prevent the undue consumption of water. At present the consumption was 48 gallons per head per day, which was a great deal too much. With reference to what he described as the second phase of the question—namely, the revenue—he went on to explain the reasons which had led the Committee to decide upon the increase in the cost of supplies by meter from 2d. to 3½d. per 1000 gallons within the borough, and to 6d. outside. The consumption was 6 million gallons daily; and the actual cost worked out to 2·79d. per 1000 gallons. In addition to the fact that they were actually selling the water at less than it cost, there was another reason why they should look ahead and consider the expense which would probably devolve upon them. Plymouth, he went on to point out, is practically dependent for its water supply upon a single pipe-line; for, though the Corporation still possess the leat, part of it is in a bad condition as to repair, and the portion nearest the town is objectionable on sanitary grounds. Without making any specific statement on the matter, Mr. Bond clearly hinted at the near approach of a time when, to provide for the increasing wants of the population, and as a safeguard against a possible breakdown, the existing pipe-line will have to be doubled. As to the growth of the undertaking, he pointed out that in the year ended March last the revenue amounted to £23,571, compared with £13,839 in the year 1891. This additional revenue was derived wholly from extra business, and without any increase in the charges. They were not proposing now to interfere with the rates for domestic supplies; and when the time came for this, they hoped an equitable arrangement would be made under which the poorer people would pay less, and the richer people a little more. They did not, however, think that water for trade purposes should be sold at a loss. The proposed increase in the charges for meter supplies would add £1800 to the revenue; and it was estimated that £600 more would be obtained by charging various institutions and other departments of the Corporation for the water they consume.

EAST SURREY WATER COMPANY.

The Annual General Meeting of this Company was held at the Offices, Redhill, on the 22nd ult.—Sir FREDERICK BRAMWELL, Bart., F.R.S., in the chair.

In the report presented by the Directors, it was stated that mains to the extent of 23 miles had been laid during the year, and 551 additional customers placed upon the books. Further reservoirs, with subsidiary works, had been constructed at Kenley; while at Purley the second borehole had been completed, and a pumping-station was being constructed. The profit for the year was £18,566, which had been increased to £20,303 with the balance of £1737 brought forward. Out of this, the Directors had placed £700 to the renewal and contingency fund; and they recommended a dividend of 5 per cent. upon the preference shares, and of 7 per cent. upon the ordinary shares (both less income-tax). The interim dividends paid in December had absorbed £6042, and the final dividends would take £6480. After payment of debenture interest, &c., there would be left £1755 to be carried forward.

The CHAIRMAN, in moving the adoption of the report, remarked that while the number of new consumers was not equal to that of the previous year, which had been one of an extraordinary character, the receipts were higher by £1900. As the shareholders might imagine, the cost of maintenance, management, &c., had increased, as had the rates and taxes—by some £400. However, he was pleased to say that the Company were prosperous. Their customers augmented in number, and they were adequately supplied with the finest water in the kingdom. They now served 70,000 persons, their area was 150 square miles in extent, and they had 340 miles of mains. Referring to the new works at Purley, alluded to in the report, he said the good progress made was due to the capability of Mr. Downes (Manager and Secretary), Mr. Cornewall-Walker (Deputy-Manager), and the staff generally, of which they were justly proud. With regard to the quality of the water, he mentioned that though, in its original condition, it had some 17° to 18° of hardness, when it reached the consumers it had only 4°. The water was not only pure, and therefore useful for drinking purposes, but, as instanced a few weeks previously, it was of great value in extinguishing fire. They had the satisfaction of knowing that, owing to the abundant supply, the houses in the immediate neighbourhood of a recent fire at Redhill were saved. Mr. Downes had received a letter from the Town Clerk (Dr. Clair J. Grece) conveying to him the thanks of a public meeting of ratepayers of the borough for "the splendid supply of water" he had kept up, "which saved the town from destruction." The Chairman added that the Company had experienced a good many raps on the knuckles, so that it was a pleasure to know that when they were good—and he thought they always were—they were also sometimes appreciated.

Sir MYLES FENTON seconded the motion, and it was carried.

The dividends recommended were declared; votes of thanks were accorded to Mr. Downes and the staff, as well as to the Chairman; and the proceedings closed.

The Stockton Town Council, on the recommendation of the Gas Committee, have agreed to increase the discount off the price of gas from 15 to 20 per cent.

OLDHAM CORPORATION WATER SUPPLY.

Mr. Andrew's Annual Report.

The Superintendent of the Gas and Water Departments of the Oldham Corporation (Mr. Arthur Andrew) has presented to the Water Committee his report on the working during the past financial year. It shows that the total expenditure on capital account was £18,067 15s. 6d., less materials transferred, &c., £222 2s. 3d. The gross revenue on water-works account amounted to £63,320 8s. 5d., and the gross expenditure to £23,071 6s. 1d.; the balance carried to the profit and loss account being £40,249 2s. 4d. On this are the following charges: Annuities and interest £30,783 3s. 1d., and sinking fund for the liquidation of debt on water-works chargeable on revenue £8480 18s. 6d.; leaving a surplus for the year of £985 0s. 9d. The credit balance brought forward was £9732 12s. 10d., which leaves a credit balance to carry forward of £10,717 13s. 7d. The total income on revenue account shows an increase over the previous year of £368 12s. 11d. The balance to the credit of the fittings account on March 25 was £568 18s. 9d., which the Committee have agreed to transfer to the Finance Committee. No alterations were made in the scale of charges for the supply of water during the year. The number of houses served was 48,972; being an increase of 803 in the year. The number of water-meters in use was 1409, against 1322 before. The length of water-mains laid in extensions, enlargements, and renewals within the district of supply during the year were 10,621 yards; and the mains taken up, 4184 yards. The number of taps brought to the stamping office to be treated and stamped was 6917, of which 6860 were passed and stamped and 57 rejected The internal water taps and fittings in houses situate within the district of supply were inspected, and notice was sent to 1033 persons requiring them to repair taps and fittings that were defective and wasting water. There was an increase of £763 13s. 8d. from the water-rents for domestic purposes, &c.; and a decrease of £513 10s. from water supplied for trade purposes by meter. The expenditure on revenue account was £23,071 6s. 1d., against £19,653 13s. 2d. The increase was principally due to the cost incurred in reconstructing the retaining wall at the head of the Piethorn reservoir, an increase of £1496 19s. 2d. in the amount paid for rates and taxes, and special law expenses amounting to £1272 17s. 2d. The increase in the amounts payable for interest on mortgages, &c., was £615 10s. 5d.; and the sums paid to the respective sinking funds were £8480 18s. 6d., against £8349 18s. 6d. in the preceding year. The amount of interest accrued to the reserve fund during the year was £832 14s. 1d.; the fund now standing at £26,602 5s. 3d. The Rooden reservoir was completed during the year; the ceremony of turning on the water supply therefrom being performed by the Mayor on July 30, 1900. The completion of this undertaking marks also the exhaustion of the powers obtained in 1886 for the construction of additional works. The Committee ordered the report, which was accompanied by voluminous tables, to be printed as usual.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The fortunes of a community are often reflected in those of the local gas undertaking. With this notion in my head, it is with satisfaction that I observe the advance which has been made during the year by the Hawick Gas Company. At the annual meeting yesterday, the Chairman (Mr. Thomas Laidlaw) stated that during the year the consumption of gas increased by 1½ million cubic feet. They had now 533 slot meters in use. The report of the Directors was one of the most satisfactory ever placed before the shareholders. The profits for the year amounted to £1722, which was about £900 more than was expected; and after paying a dividend of 10 per cent., there was a balance in hand of £152. Coal cost £1525 more than the previous year. He was glad to be able to say that the electric light had not made the headway which some anticipated it would; and neither had it caused any decrease in the consumption of gas, nor affected the price of the shares. The Directors recommended that the charge for gas be reduced from 3s. 9d. to 3s. 6½d. per 1000 cubic feet. This was agreed to. Last year the price of gas was advanced by 5d. per 1000 cubic feet.

The Galashiels Gas Company held their 67th annual meeting on Tuesday. It was reported that there was a profit of £1979 on last year's working. The reserve fund, invested in the works, amounted to £6198. A dividend at the rate of 10 per cent. was paid, which required £2100; and the reserve fund is now £6077. The quantity of gas manufactured was 53,963,800 cubic feet, the quantity sold 51,186,769 cubic feet, consumed on works 500,000 cubic feet, and unaccounted for 2,277,031 cubic feet. There was a decrease in the quantity sold of 1,245,441 cubic feet as compared with the previous year. The price was fixed at 3s. 9d. per 1000 cubic feet, the same as last year, when it was advanced by 5d. This is not quite so satisfactory; but I presume the local conditions are accountable for it.

The annual meeting of the Saltcoats Gas Company, Limited, was held on Tuesday, with Mr. L. Alpine in the chair. The report showed a balance at the credit of profit and loss account, after providing for depreciation of works and the expenses of forming the limited liability Company (amounting together to £455), of £888. Out of this, a dividend at the rate of 5½ per cent. was paid; and £8 was carried forward. Last year the price of gas was raised from 3s. 4d. to 3s. 9d. per 1000 cubic feet; and it has now been reduced to 3s. 4d. again. Four large purifiers are in course of erection at the works. The quantity of gas made was 21,031,300 cubic feet; and the gas unaccounted for was 1,553,508 cubic feet, or equal to 7·38 per cent. Appended to the report of the Directors there is a most elaborate abstract of the coal account and production of gas, by the Manager (Mr. J. Napier Myers). This shows that the Company have been highly progressive in every sense of the term. During the past six years, the quantity of gas made has increased from 13 to 21 million cubic feet, the yield per ton of coal

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 86.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.	GAS COMPANIES.			£ s. d.
590,000	10	Apl. 12	10½	Alliance & Dublin 10 p.c.	18½—19½	..	5 7 8
100,000	10	,,	7½	Do. 7 p.c.	13—14	..	5 7 2
300,000	100	July 1	5	Australian 5 p.c. Deb. .	100—102*	..	4 18 0
200,000	5	May 15	6½	Bombay, Ltd. . . .	6—6½	..	5 0 0
40,000	5	,,	6½	Do. New, £4 paid	4½—4¾	..	5 9 5
380,000	Stk.	Feb. 14	12	Brentford Consolidated	260—265	..	4 10 7
270,000	,,	,,	9	Do. New . . .	190—195	..	4 12 4
50,000	,,	,,	5	Do. 5 p.c. Pref. .	128—132	..	3 15 9
159,375	,,	June 14	4	Do. 4 p.c. Deb. .	111—114	..	3 10 2
220,000	Stk.	Mar. 14	10	Brighton & Hove Orig.	222—227	..	4 8 1
226,320	,,	,,	7	Do. A. Ord. Stk. .	155—160	..	4 7 6
1,022,500	Stk.	Feb. 27	5	Bristol, 5 p.c. max. .	121—123	..	4 1 4
420,000	20	Mar. 28	10	British.	41—42	..	4 15 3
50,000	10	Feb. 28	12	Bromley, Ord. 10 p.c. .	24—26	..	4 12 4
79,000	10	,,	9	Do. 7 p.c. . . .	19—21	..	4 5 8
500,000	10	May 31	6	Buenos Ayres (New) Ltd.	8½—9½	..	6 6 4
220,000	Stk.	June 28	4	Do. 4 p.c. Deb.	94—97*	..	4 2 6
150,000	20	Mar. 14	8½	Cagliari, Ltd. . . .	22—24	..	6 17 6
100,000	10	May 31	10	Cape Town & Dis., Ltd.	15—16	+½	6 5 0
50,000	50	May 2	6	Do. 6 p.c. 1st Mort.	52—54	+1	5 11 1
550,000	Stk.	Apl. 12	12	Commercial Old Stock	270—280	..	4 5 9
236,425	,,	,,	9	Do. New do. .	205—210	..	4 5 9
238,237	,,	June 14	4½	Do. 4½ p.c. Deb.	128—133	+3	3 7 8
800,000	Stk.	May 31	9	Continental Union, Ltd.	160—165	..	5 9 1
200,000	,,	,,	7	Do. 7 p.c. Pref.	160—165	..	4 4 10
575,000	Stk.	Feb. 28	5	Crystal Palace Ord. 5 p.c.	120—125	..	4 0 0
60,000	,,	,,	5	Do. 5 p.c. Pref.	125—130	..	3 16 11
486,090	10	Jan. 31	11	European, Ltd. . . .	19⅝—20⅜	..	5 7 3
354,060	10	,,	11	Do. £7 10s. paid	14½—15½	..	5 6 5
15,079,885	Stk.	Feb. 14	4 5/16	Gas-light and Coke { 4 p.c. Ord. . .	95—97	..	4 10 9
2,600,000	,,	,,	3½	{ 3½ p.c. max. .	90—92	..	3 16 1
3,799,735	,,	,,	4	{ 4 p.c. Con. Pref.	108—111	..	3 12 1
4,063,425	,,	June 14	3	{ 3 p.c. Con. Deb.	92—94	..	3 3 10
70,000	10	May 31	8	Hongkong & China, Ltd.	13—14	..	5 14 4
3,800,000	Stk.	May 15	10	Imperial Continental .	208—212	..	4 14 4
473,600	Stk.	Feb. 14	3½	Do. 3½ p.c. Deb. Red.	100—102	..	3 8 8
561,000	Stk.	Feb. 28	10	Liverpool United A	235—237	+1	4 4 5
678,100	,,	,,	7	Do. do. B	172—176	..	3 19 7
306,083	,,	June 28	4	Do. do. Deb. Stk.	118—120*	..	3 6 8
75,000	5	June 14	4	Malta & Medn., Ltd. .	4½—5	..	4 0 0
560,000	100	Apl. 1	5	Met. of { 5 p.c. Deb.	105—108	..	4 12 7
250,000	100	,,	4½	Melbourne { 4½ p.c. Deb.	103—105	..	4 5 9
541,920	20	May 31	3½	Monte Video, Ltd. . .	9—10	..	7 0 0
717,946	Stk.	Feb. 22	8½	Newc'tle & G'tesh'd Con.	230—231	..	3 13 7
312,855	Stk.	June 28	3½	Do. 3½ p.c. Deb.	97—99*	..	3 10 8
150,000	5	May 15	8	Oriental, Ltd. . . .	7—7½	+¼	5 6 8
135,000	5	,,	8	Do. New, £4 10s. pd.	6—6½	..	5 10 10
15,000	5	,,	8	Do. do. 1879, £1 pd.	1¾—1⅞	..	4 11 5

*Ex. div.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
			p.c.	GAS COMPANIES.			£ s. d.
60,000	5	Feb. 28	7	Ottoman, Ltd. . . .	5¾—6¼	..	5 12 0
851,070	10	Apl. 26	7	River Plate Ord. . .	10¾—11¼	..	6 4 5
250,000	Stk.	June 28	4	Do. 4 p.c. Deb. .	96—98*	—1	4 1 8
250,000	10	Mar. 28	8	San Paulo, Ltd. . . .	10⅞—11⅛	..	6 19 1
135,000	Stk.	Mar. 14	10	Sheffield A	235—240	..	4 3 4
209,984	,,	,,	10	Do. B	234—236	..	4 4 9
523,498	,,	,,	10	Do. C	232—234	..	4 5 6
5,761,885	Stk.	Feb. 14	5	South Met., 4 p.c. Ord.	125—127	+½	3 18 8
1,547,965	,,	Jan. 16	3	Do. 3 p.c. Deb. . .	93—96	..	3 2 6
380,940	Stk.	May 15	5	Southampton Ord. . .	106—111	..	4 10 1
70,825	,,	Jan. 16	4	Do. 4 p.c. Deb.	105—110	..	3 12 9
120,000	Stk.	Feb. 28	6	Tottenham and Edmonton { A. 5 p.c.	115—120	..	5 0 0
250,520	,,	,,	4½	{ B. 3½ p.c.	85—90	..	5 0 0
182,380	10	Jan. 16	5	Tuscan, Ltd.	8—9	..	5 11 1
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	95—100*	..	5 0 0
230,000	5	Feb. 28	9	West Ham, 10 p.c. . .	9—10	..	4 10 0
147,000	10	,,	6	Do. 7 p.c. . .	11⅝—12⅜	..	4 16 0
128,984	Stk.	June 28	4	Do. 4 p.c. Deb.	103—108*	..	3 14 1
				WATER COMPANIES.			
780,599	Stk.	June 28	11	Chelsea, Ord. . . .	285—290*	..	3 15 10
150,000	,,	,,	5	Do. 5 p.c. Pref. .	153—158*	..	3 3 3
160,000	,,	,,	4½	Do. 4½ p.c. Pref. '75	137—140*	..	3 4 4
175,785	,,	Mar. 28	4½	Do. 4½ p.c. Deb. .	140—145	..	3 2 1
1,720,560	Stk.	Apl. 12	7	East London, Ord.. .	188—193	..	3 12 6
654,740	,,	June 14	4½	Do. 4½ p.c. Deb. .	143—148	..	3 0 10
980,169	,,	,,	3	Do. 3 p.c. Deb. .	94—96	..	3 2 6
700,000	50	June 14	8	Grand Junction { 10 p.c. max..	103—106	..	3 15 6
310,000	Stk.	Mar. 28	4	{ 4 p.c. Deb..	123—127	..	3 3 0
708,000	Stk.	Feb. 14	14	Kent	285—295	..	4 14 11
160,000	,,	,,	7	Do. New, 7 p.c. max..	200—205	..	3 8 4
1,043,800	100	June 28	10½	Lambeth, 10 p.c. max..	265—275*	..	3 16 4
406,200	100	,,	8	Do. 7½ p.c. max..	200—205*	..	3 18 1
350,000	Stk.	Mar. 28	4	Do. 4 p.c. Deb..	123—126	..	3 3 6
500,000	100	Feb. 14	13⅔	New River, New Shares	400—405	..	3 7 11
1,000,000	Stk.	Jan. 31	4	Do. 4 p.c. Deb..	127—132	..	3 0 7
902,300	Stk.	June 14	6	South-wark and { Ord. . . .	172—177	..	3 7 9
126,500	100	,,	6	{ 7½ p.c. max.	162—167	..	3 11 10
489,200	Stk.	,,	5	{ 5 p.c. Pref. .	150—155	..	3 4 6
1,019,585	,,	Apl. 12	4	Vauxhall { 4 p.c. A Deb.	125—130	..	3 1 7
1,155,066	Stk.	June 14	10	West Middlesex. . .	260—265	..	3 15 6
200,000	,,	,,	4½	Do. 4½ p.c. Deb. .	138—143	..	3 2 11
200,000	,,	Mar. 14	3	Do. 3 p.c. Deb. .	95—98	..	3 1 3

*Ex. div.

from 9300 to 11,000 cubic feet, gas sold from 8400 to 10,200 cubic feet per ton, and consumers from 1590 to 2018. This is a splendid record, which quite justified the Chairman in saying that they would find some interesting figures in the manufacturing returns. The returns for the past year were very satisfactory, for which they had to thank the Manager and his assistants. The financial returns for the year looked better than they really were, on account of their having begun with over 100 tons of coal in stock (accumulations from previous years), which saved them considerable outlay.

The Motherwell Gas Company held their annual meeting on Thursday. In their report, the Directors intimated a continuation of the prosperity of the Company. The income for the year was £14,996, and the expenditure £11,310. The receipts from residual products amounted to £2745, as compared with £1517 in the previous year. It was agreed to reduce the price of gas from 3s. 9d. to 3s. 4d. per 1000 cubic feet. The customary dividend at the rate of 10 per cent. was paid.

The Markinch Gas Company have paid a dividend at the rate of 5 per cent. for the past year, and have continued the price of gas at 5s. 5d. per 1000 cubic feet. The Crieff Gas Company have paid a dividend at the rate of 5 per cent., with a bonus of 1s. per share, which is equal to another 5 per cent., and have reduced the price of gas from 4s. 7d. to 4s. 2d. per 1000 cubic feet. The Coupar Angus Gas Company have paid a dividend at the rate of 2½ per cent., as compared with 7½ per cent. a year ago, and have continued the price of gas at 5s. 10d. per 1000 cubic feet. The Stirling Gas Company have reduced the price of gas from 3s. 9d. to 3s. 7d. per 1000 cubic feet.

It will be remembered that last November the Town Council of Aberdeen, while declining to increase the wages of their employees in the gas-works, gave an undertaking that the question would be considered at the time when the estimates for the ensuing year were being made up. That period is approaching, if it has not yet arrived; and accordingly this week a letter was submitted at a meeting of the Town Council, from Mr. W. Blackwood, the Secretary in Scotland of the Gas Workers and General Labourers' Union, in which the petition was preferred that time-and-a-half be paid for all overtime, every day to stand by itself, and that season men be paid double time for all holidays as formerly. It was added that a deputation of the men, accompanied by himself, would be pleased to wait upon the Committee. The letter was sent to the Gas Committee; the Convener (Mr. Kemp) remarking that it would be considered when they came to fix the price of gas in the autumn.

Mr. W. M'Crae, the Gas Engineer and Manager to the Dundee Corporation, has reported regarding the progress which has been made with the extensions to the gas-works. He states that all the brick, iron, and slate work in connection with the new retort-house and coal-stores, is completed; the north chimney was finished on May 30, and the south chimney is completed to a height of 50 feet; fire was put to the north new retort-bench on May 30, and the brickwork is gradually getting heated up in a satisfactory manner; all the arches in the south bench are completed, and the erection of the iron work in connection with it is making satisfactory progress; the stage-floors on both sides of the north bench have been completed, and the floors at the south bench are being put in; the stone piers and girders for the elevated railway have been erected, and as many sidings on the high level have been laid down as are at present possible, all the rock not having been excavated at one part; the erection of pumping engines and boilers has been commenced; good progress is being made with the erection of coal-breakers and stoking machinery; and the foul-main from the new retort-bench to the existing condensers is almost completed. Mr. M'Crae is to be congratulated upon the approaching completion of this great work.

The proposed transfer of the Newport Gas Company's undertaking to the Corporation was again under consideration by the Corporation on Monday last. Provost Thomson said that the Council had made an amended offer to the Company; that the Company required to hold two meetings to consider the offer; that the Corporation were, therefore, not in a position to adopt the Burghs Gas Supply Acts; and that it would be necessary to again adjourn the subject. He moved that it be adjourned till Aug. 5. This was agreed to. The Council have advanced their offer, first from £8500 to £10,072, and now to £10,500. It is part of the offer that the Council shall take over the Company's contracts at contract prices, and shall also purchase at valuation price and take over consumers' gas accounts in arrear and other outstanding accounts, the gas consumed since last survey, the gas in stock, and the stocks of coal, coke, lime, oxide of iron, tar, and ammoniacal liquor in the works, or in transit to or from the works, on the date of entry; and that the term of entry shall be Sept. 7, 1901, or the date which shall be held as the date of adoption of the Burghs Gas Supply (Scotland) Act, 1876, in terms of section 5 of the Act, whichever of the dates shall last happen.

The report by the Water Committee of the Glasgow Corporation for the year ending May 31 states that the revenue amounted to £204,716, that from hydraulic power works to £8255, and that from river supply works to £3540—a total of £216,511, or an increase of £3777 as compared with the previous year. Adding £22,740 brought forward, the total income was £239,252. The expenditure, including annuities and interest, amounted to £159,987, that for hydraulic power works to £7042, and that for river supply works to £4342 —a total of £171,373, or a decrease of £1372 as compared with the preceding year. Of the balance of £67,878, a sum of £60,711 is carried to the sinking fund, which now amounts to £1,075,628; while £7167 is carried to next year's accounts. The amount expended on new works during the past year was £63,001. The capital outlay on the Craigmaddie reservoir works, new aqueduct, and raising the level of Loch Katrine amounts to £1,329,406. These figures give some idea of the magnitude of the great water undertaking of the Corporation of Glasgow.

A meeting of the Northumberland Miners' Conciliation Board was held in Newcastle last Saturday to consider the wages question. The Accountants' quarterly ascertainment showed a fall in the prices of coal; and the meeting decided to reduce the miners' wages by 8¾ per cent. In April last a reduction was made of 13¾ per cent.

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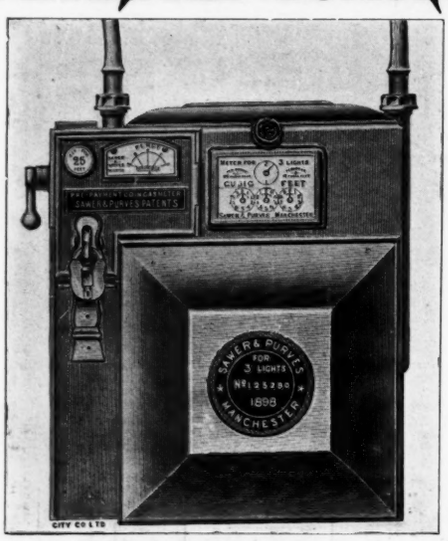
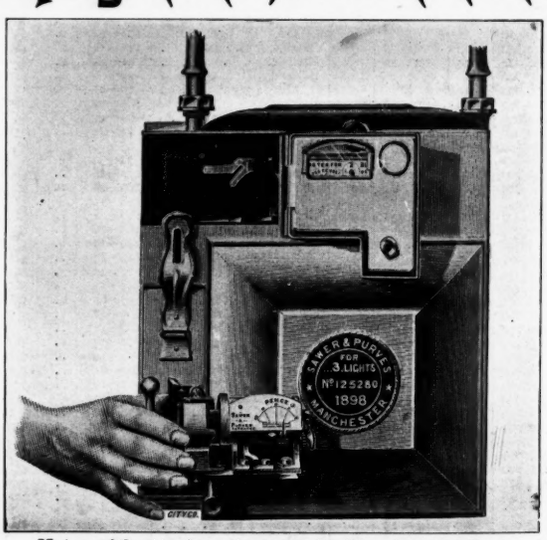


Meter in working position.



Meter with attachment removed without uncoupling.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *July 6.*

Sulphate of Ammonia.—There has been rather more doing, but not enough to effect any improvement in values; the closing quotations being £10 5s. per ton, f.o.b. Hull, and £10 10s. to £10 11s. 3d. per ton f.o.b. Liverpool and Leith. Buyers have displayed greater disposition to take advantage of the present level of prices; but makers continue to offer their output as it becomes available, and the supply has been equal to the demand. Any special demand, however, might create a diversion in favour of producers, the output being now at its minimum. The situation for delivery ahead is unchanged. Makers are firm at last week's quotations. Buyers so far refuse to pay the premium required, though willing to operate at a moderate advance on prompt values.

Nitrate of Soda remains firm in all positions, and extensive purchases for next year's shipment indicate the confidence of middlemen in the stability of the combination and of the market. Spot quotations are 8s. 9d. to 8s. 10½d. per cwt., according to quality.

LONDON, *July 6.*

Tar Products.—The markets are quiet, and little doing. Pitch continues very steady, especially in London. Beckton has made further sales at 31s., and now ask 32s. for next season. Prices remain firm in the North. Most of the Yorkshire makers appear to have placed the bulk of their production for next season. Tar oils are in very good demand so far as London is concerned; but there is rather more offering in the North of England. It would seem as if there were stocks which makers are anxious to dispose of. Carbolic acid is in a very depressed state; and consumers do not care to purchase forward. An offer of 2s. 2d. for a large quantity of 60's was declined; but business is reported at 2s. 3d. for July-September. Benzol is rather better. Some small parcels were sold at 8¼d. at an outport; but since then 9d. has been paid, and, in one instance, 9½d. was realized for July-August delivery. There appears to be a slightly improved demand; and deliveries are being taken more freely. Solvent remains very quiet. There is no demand for export, which naturally depresses prices. Anthracene remains in precisely the same position. There is no business to report.

The average values obtaining during the week are: Tar, 14s. 6d. to 17s. 6d. Pitch, east coast, 30s. to 31s; west coast, 28s. to 28s. 6d. Benzol, 90's, 8¾d. to 9¼d.; 50's, 8¾d. to 9¼d. Toluol, 10½d to 11d. Crude naphtha, 4d. Solvent naphtha, 1s. to 1s. 1d. Heavy naphtha, 11d. to 1s.; Creosote 1¼d. to 1⅜d. Heavy oils, 2¼d. to 2⅜d. Carbolic acid, 60's, 2s. 3d. Naphthalene, 60s. to 75s.; salts, 35s. to 42s. 6d. Anthracene, "A," 2½d.; "B," 2d. (nominal).

Sulphate of Ammonia.—There is no alteration to report as regards value, although the demand has been fairly well maintained. The Gaslight and Coke Company still quote £10 15s.; but during the past week business has been done in Beckton make at under this price. In Hull, there is not much doing. Some sales are reported at £10 5s. to £10 6s. 3d. In Leith, business has been done for forward delivery at improved prices; but £10 7s. 6d. was accepted for prompt delivery in more than one instance. In Liverpool, transactions have been very limited; but prices appear to be fairly well maintained.

COAL TRADE REPORTS.

Lancashire Coal Trade.—Very little material change can be reported in the position generally throughout the coal trade of Lancashire. The better qualities continue to meet with the usual slow summer demand for house-fire purposes; but as Lancashire collieries are being put on short time, ranging from three to four days per week, the local output is not excessive. Prices are being fairly well maintained at about 15s. per ton at the pit for best Wigan Arley, 13s. to 13s. 6d. for Pemberton four-feet and seconds Arley, and 11s. to 11s. 6d. for common house coal. Surplus output from other districts, however, still comes in at low-cut figures; but Lancashire coalowners apparently are not attempting to meet this competition by any general reduction in their own quotations. For the commoner qualities of round coal, prices continue weak, as regards quantities for long forward delivery. Ordinary steam and forge descriptions for contracts range from 9s. to 9s. 6d. per ton at the pit. For unscreened gas coals, it is an understanding among the Associated Coalowners that they can reduce contract quotations 3s. 6d. per ton on last year's prices. The object of this is evidently to keep as much slack as possible off the market; but even the exceptional concession made upon unscreened coals does not appear to have been met very favourably by gas companies, as, of course, there is no guarantee as to the amount of slack that may be contained in the through-and-through coal supplied to them. With regard to the Manchester Corporation gas coal contracts, to which reference was made last week, further particulars obtainable show that in one or two instances where Lancashire coalowners were able to place considerable quantities, they reduced their quotations 3s. per ton on last year's prices—representing 10s. 6d. per ton at the pit for good screened gas coals—while some portion of the contract was obtained by coalowners in Yorkshire who have not previously supplied gas coal to the Manchester Corporation, and who, to secure orders, quoted below 9s. per ton at the pit. The general run of prices for gas coal in the Lancashire district ranges from 10s. and 10s. 6d. per ton for the lower descriptions, up to 10s. 9d. and 11s. for the best qualities, with 11s. 3d. perhaps obtained in some special cases. With pits running short time, and the lessened quantity of round coal now being screened, there are not quite such excessive supplies of engine fuel upon the market as of late; and in this district prices are perhaps a trifle steadier—ranging from 6s. 6d. to 7s. per ton at the pit for common, up to 8s. and 8s. 6d. for the best qualities of slack. There is still a large quantity of cheap slack coming in from other districts; but the very low priced parcels are fewer in number, and buyers are not now able to obtain quantities so readily at

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much under local quotations as they were a few weeks back. Shipping is very quiet, with forward contracts for steam coal taken at 10s. to 10s. 6d. per ton, and 11s. to 11s. 6d. quoted on current sales for good qualities, delivered at the Mersey ports. A steady tone is maintained in the coke trade, with good Lancashire foundry sorts ranging from 23s. to 25s. per ton, according to quality; and good washed Lancashire furnace cokes 12s. 6d. to 13s. per ton at the ovens.

Northern Coal Trade.—There is a steady demand; but the production is now at its normal height, and for some classes of coal there is an easing off in the prices. Best Northumbrian steam coals are quiet at 13s. a ton f.o.b., and collieries are well employed. Second class steams are 12s. 3d. to 12s. 6d., and steam smalls are 5s. to 5s. 3d.; little, if any, improvement in the latter having yet resulted from the remission of the tax on that class of coals. In the gas coal trade, the demand is now a little better on contracts; the lower range of prices having come into operation. In the case of the Stockton contracts, which are concluded, the price is less by 6s. per ton than that of the recently terminated contracts. For occasional cargoes, the price of best Durham gas coals is about 10s. to 10s. 3d. per ton f.o.b.—a fall on the quotation of last week, when supplies were scarce. The coke trade seems rather easier. Gas coke is in limited production, and also in moderate demand; the quotation being from 12s. to 13s. per ton f.o.b.

Scotch Coal Trade.—The tendency in prices is still downward; but it may receive a check when the wages question, which falls to be reconsidered at the end of this month, is decided. It is understood that, in consequence of the state of the forward market, coalowners intend to move for a further reduction of miners' wages, and that the men are averse to the proposal, and may stand out against it. Only the better qualities of coal are in demand; inferior sorts are at present being stacked in some places. The prices quoted are: Main 9s. to 9s. 3d. per ton f.o.b. Glasgow, ell 10s. to 11s., splint 10s. to 10s. 3d. The shipments for the week amounted to 217,130 tons—a decrease of 7987 tons upon the preceding week, and of 16,024 tons upon the corresponding week of last year. For the year to date, the total shipments have been 4,620,254 tons—a decrease of 941,422 tons upon the same period of last year.

Reductions in Price.—The Directors of the Crystal Palace District Gas Company have reduced the price of gas 3d. per 1000 cubic feet (to 2s. 7d.) from the date of the Midsummer quarter's accounts. A reduction of 6d. per 1000 cubic feet, to take effect from the 24th ult., has been announced by the Christchurch Gas Company. The Gas Committee of the Smethwick Corporation have decided to reduce the price of gas for illuminating purposes 3d. per 1000 cubic feet, as from Michaelmas next. They recently made a reduction of 7d. per 1000 cubic feet in charge to manufacturers for gas used for heating and power purposes; and, as the result, an agitation was commenced among the tradesmen and others. The present concession by the Committee will, it is thought, set this at rest.

Gas Coal Contracts and the Reduced Price of Coal.—It was stated on the Birmingham Exchange last Thursday that the Gas Committee of the Corporation had fixed all their contracts for the ensuing twelve months; that the prices agreed upon showed a considerable reduction (nearly 5s. per ton) upon the former figures; and that the contracts would be spread over a number of firms. It was reported that two large firms who have lately been supplying had been passed over. It is expected that a saving of nearly £100,000 will be effected. At the meeting of the Salford Corporation on the previous day, tenders for the supply of coal and cannel for the next ten months were accepted. Alderman Phillips, the Chairman of the Gas Committee, remarked that the contracts involved the supply of 90,500 tons of coal and 50,000 tons of cannel. They were very advantageous; the average reduction in the price to be paid for the coal being 2s. 9d. per ton as compared with last year.

Electric Power Supply in Yorkshire.—The Select Committee of the House of Lords of which Lord Brougham and Vaux is Chairman, last Friday, allowed the Yorkshire Electric Power Bill to proceed. Under the Bill, sanction is sought to supply electricity for power in a district 1820 square miles in extent in the West Riding of Yorkshire. The capital required for the scheme is £2,000,000, with borrowing powers of £665,000 more. The chief opposition was offered by the Corporations of Leeds, Sheffield, and Bradford, who desired absolute power to prohibit the Company from supplying in their areas, even to the limited extent proposed—viz., to railways, water companies, and canals; and they also objected to the Company's proposed power as to wayleaves to carry their cables through these places in order to supply districts beyond. The Committee found the preamble of the Bill proved, and gave the power sought to supply railways, canals, and water companies in the areas of the Corporations, but fixed certain districts in the centres of the towns named within which the Company are not to lay their mains.

Buckfastleigh Water Supply.—An inquiry was held at Buckfastleigh on Friday respecting an application made by the District Council to the Local Government Board for permission to borrow £3910 for works of water supply. It was explained that the present supply is inadequate, and it was proposed to supplement it according to plans prepared by Mr. T. W. Stainthorpe, of Totnes. The supply is to be derived from Lambsdown Moor, 4 miles from Totnes, where the Council propose to acquire 112 acres of land and collect the underground water by adits. A service reservoir of a capacity of 271,500 gallons is to be constructed, which will contain about seven days' supply at 15 gallons per head. The total cost of the scheme is estimated at £4657. Opposition was offered on the part of a landowner in the district, who complained that it did not include the whole area which would be rated for the cost, and a member of the District Council, who thought the existing supply should be abandoned, at least for domestic purposes, and a sufficient supply obtained from a new source. Mr. Stainthorpe said the only alternative to his scheme was the construction of an impounding reservoir, and this would be far too costly for the district.

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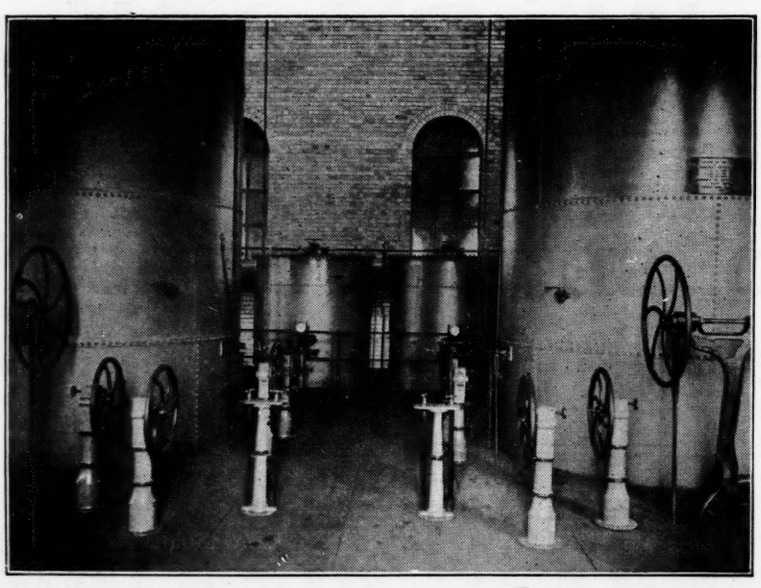

RESULTS PROVE EFFICIENCY.

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Witham in Darkness.—An extraordinary dispute has arisen between the Witham Urban District Council and the Gas Company respecting the price of gas, with the result that at night the town is in darkness. It appears that some six months ago the Company sent an intimation to the Council to the effect that the terms for lighting the street-lamps could not be renewed. The Council took no notice. The Company then sent in a demand for 33 per cent. rise in the charges; and this the Council point-blank refused to pay. The reply of the Company was to cut off the supply.

Cork Gas Workers' Strike.—On Sunday, the 30th ult., a public demonstration was held in Cork to support the gas workers on strike. Alderman W. Cave, President of the Cork United Trades Association, occupied the chair. Alderman Kelleher proposed—"That we, the workers of the city of Cork, in public meeting assembled, hereby proclaim the solidarity of labour, and solicit the moral and financial support of every worker and every friend of the worker on behalf of the gas workers on strike." The motion having been carried, Mr. J. Lane proposed—"That we call on the gas consumers of the city of Cork to sign a petition to the Company asking for better gaslight; and, as a means thereto, request the Directors of the Gas Company to speedily come to an arrangement whereby the gas workers may be reinstated." Mr. R. Cody seconded the motion. Alderman O'Connor, in supporting it, said that if the just and reasonable claims of the men were not acceded to he would be the first to stop taking gas from the Company, and never pay them another penny. He sincerely trusted that the Company would be guided by wisdom and generosity in the matter, and not persecute their employees any further.

Exeter Water-Works Extensions.—Mr. A. A. G. Malet, Assoc.M. Inst.C.E., held a Local Government Board inquiry at Exeter last Thursday relative to the application of the City Council for leave to borrow £13,000 for extensions at the water-works. The original estimate was £36,000; but, owing to the enhanced cost of material, the higher price of labour, excavation work, and other causes, the cost has run up to £49,000. The new scheme will not only provide an ample supply of water for all parts of the city, but the new tanks will enable all the water consumed by the city to be filtered, which has not hitherto been the case. Mr. G. R. Shorto, the Town Clerk, stated that the population was 47,133, and the rateable value £228,000. There had been borrowed under the Sanitary Acts £78,942; and for sanitary purposes, under local Acts, £67,400. Loans sanctioned, but not raised, amounted to £85,000, or a total of £231,342. Mr. Donald Cameron, the City Surveyor, explained the details of the scheme, and how the increased cost arose. Whereas trial pits on the site of the filter-beds and settling-tanks, located clean gravel, actual operations showed that they were "pockets" only which had been encountered, and that the quantity on the whole site was so small as to be of no appreciable value. Further, the new intermediate reservoir cost 80 per cent. more than had been estimated, owing to a new site having to be found and blasting operations conducted. There was no opposition to the application.

Additional Capital for the Woking Water Company.—At an extraordinary meeting of the Company held last Tuesday, the Chairman (Mr. Charles Horsley, J.P.) moved the following resolution: "That the Company raise, by the creation and issue of ordinary shares or new ordinary stock, as the Directors may think fit, under the provisions of the Woking Water and Gas Act, 1899, for the purpose of that Act and the general purposes of their undertaking, £20,000, part of the £120,000 further capital by the Act authorized." Mr. R. Hesketh Jones seconded the motion, and it was carried unanimously. The Chairman next moved resolutions authorizing the Directors to issue any sum or sums not exceeding one-fourth of the £20,000 debenture stock at 4 per cent. per annum, for the sum of £2500 authorized to be raised on Sept. 6, 1898; and also for a sum not exceeding one-fourth of the £20,000 which the meeting had just resolved to raise. These resolutions were formally seconded by Mr. Jones and carried.

Carlisle New Water Scheme.—A meeting of the Geltsdale Water Committee of the Carlisle Corporation was held last Friday, at the Town Hall, when, we learn, the proceedings were of an exciting nature. A report was read from Mr. E. M. Eaton, the Consulting Engineer to the Corporation, showing by what means the specifications could be cut down, so as to effect a saving of £9000. Reports by Mr. C. B. Newton, the Gas and Water Engineer, and Mr. A. H. Collingwood, the Town Clerk, were also submitted. Eventually, Mr. G. White moved a resolution urging that "the Council be recommended to dispense with the services of the Engineer and Consulting Engineer, and, after the remaining notices to treat are served, that the matter remain in abeyance for twelve months, after which the very best available advice be sought upon the scheme." This resolution was carried with two dissentients—Mr. Tweedy and Mr. Saint. The resolution will come before the meeting of the Town Council to-day for confirmation or otherwise.

Water Supply Difficulties at Winshill.—Some extraordinary scenes have lately been witnessed in Winshill, an outlying ward of the borough of Burton-upon-Trent. The district has hitherto for the most part depended upon wells for its water supply, but these have been condemned, and the Corporation have instructed the South Staffordshire Water-Works Company to connect the houses with their mains. As the Company, owing to the extreme elevation of the locality, decline to guarantee a constant supply beyond the floor-level, the inhabitants resent the intrusion of the workmen, and as soon as they have broken up the road and made an aperture, the people—more particularly the female portion of the population—have immediately filled it in, and thrown the workmen's tools away. A town councillor who has taken a leading part in the movement, saw the Company's men approach the house of a neighbour (who was absent) to begin operations; and he immediately sent for the police, whereupon the men hastily retreated. It was announced last Friday evening that the Health Committee had decided to recommend the Corporation to take proceedings against certain of the ratepayers for obstruction. If this is finally determined upon, some interesting questions will be involved.

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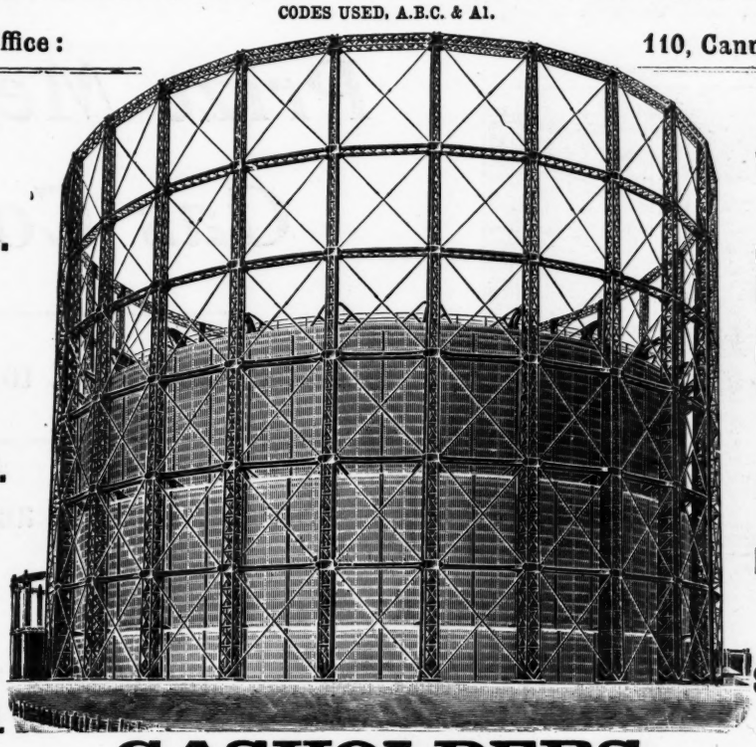

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Faringdon Water Scheme.—New water-works for the supply of Faringdon have recently been completed, at a cost of about £5700, from plans prepared by Mr. G. Winship, Assoc.M.Inst.C.E., of Oxford. They comprise a pumping scheme, with deep-well pumps and oil-engines (both in duplicate), and service reservoir.

Fylingdales Water Supply.—At a recent special meeting of the Whitby Rural District Council, it was decided that they should borrow £4625 (this being the amount sanctioned by the Local Government Board) for the purposes of water supply for the township of Fylingdales; the same to be repaid, with interest at the rate of £3 15s. per cent., within the period of thirty years.

Incandescent Gas v. Electric Lighting in Liverpool.—Replying to a question by Mr. Taggart, at the meeting of the Liverpool City Council last Wednesday, as to why the extension of the electric light had ceased, the Chairman of the Electric Power and Lighting Committee (Mr. Higginbottom) replied that electric lighting was more costly than incandescent gaslight, while the latter was quite as good. Mr. Taggart asked if the estimate was not based on the price of 4d. per unit for electricity, whereas it was now supplied at 1·5d. per unit. Alderman Petrie said it was based on the present cost.

Newtown Gas-Works Purchase.—A special meeting of the Newtown Urban District Council was held on Monday last week, when the Gas Committee reported that they had made final arrangements for the Council taking over the works and plant of the Newtown Gas and Coke Company, Limited, on that day, in accordance with the agreement arrived at during the arbitration in February last. They had approved the agreement between the Council and Mr. O. D. S. Taylor embodying the terms of the latter's engagement as Manager and Secretary. The only point which remained was the question of the stock-in-trade, for which the Company claimed to be paid £4091 16s. 3d. The Council's adviser (Mr. W. A. Valon) recommended them to offer £220; and no arrangement had been arrived at. The report was adopted.

Bury Corporation Finances.—Mr. Hunter, Chairman of the Finance Committee of the Bury Corporation, commenting recently upon the Borough Treasurer's report, said that the past year, in consequence of the lessened profits on the gas-works, the increased loss on the markets, the unexpected expenditure of £1000 on the small-pox hospital, and the wiping away of a profit on the electricity works, had been a rather lean one. These items amounted to about £6000. Fortunately, however, if the Committees would keep well within their estimates, it was thought they could do without any increase in the rates, save one of 3d. in the pound on the borough rate. In arriving at this decision, the Committee had borne in mind the fact that they were calling in the sum of £100,563 from the Bury and District Joint Water Board. It was resolved to make a precept upon the Overseers for £17,750; that notice be given to the Water Board to repay to the Corporation the capital sum due to the sinking fund account of £100,563, with interest; and that the Borough Treasurer, Town Clerk, and Borough Auditors should prepare a financial scheme dealing with this sum, and report at a future meeting of the Committee.

Birkdale and Its Gas Supply by Southport.—Mr. Clinning stated at the last meeting of the Birkdale District Council that, notwithstanding the increased gas-main accommodation the Southport Corporation had entailed upon them, they had not got the illuminating power they were entitled to. Recent tests showed only 13·95 and 13·82 candles.

Gas Supply in the Wigan Out-Districts.—At the meeting of the Wigan Town Council last Tuesday, Alderman Holmes, in moving the adoption of the minutes of the Gas Committee, stated that the price of gas outside the mile radius had been considered, and it had been decided that a uniform charge of 3s. per 1000 cubic feet should be made for gas supplied for lighting purposes both through ordinary and slot meters, subject to present discounts. Mr. Segrave moved, as an amendment, that the resolution should be referred back to the Committee, and urged that it was unfair that the people in the town should not share in the reduction. It was pointed out to Mr. Segrave that he had overlooked the fact that the people of Wigan shared in the profits of the undertaking; and that the reduction would establish a feeling of goodwill between themselves and the people in the out-townships. The amendment was lost; and the minutes were confirmed.

Warrington Corporation Gas Supply.—The Gas Committee of the Warrington Corporation have just submitted to the Town Council the thirteenth annual report of the Engineer (Mr. W. S. Haddock). It set forth that the weekly output of gas is now from a quarter to half a million cubic feet per week less than in the corresponding period last year. The price of tar products and sulphate of ammonia had fallen 15 to 20 per cent., and unless they recovered quickly there would be great difficulty in carrying on the works at a profit. A reduction of about 2s. 6d. per ton had been conceded to those who had entered into contracts for next year's supply of coal. In the case of the Corporation, the decreased expenditure on coal would be more than counterbalanced by the diminished revenue from coke. The action of the maltsters in declaring gas coke unsuitable for malting had caused large quantities of coke to be thrown on the market; and this had had an adverse effect upon the price.

Suggested Improvements at the Congleton Gas-Works.—The Gas Committee of the Congleton Corporation recently had a meeting to receive a report by Mr. W. Orme, the Manager, on certain proposed improvements at the gas-works. Mr. Orme advocates the provision of new plant at a total cost of £4000; £3500 of the amount being set down for a new retort-bench and fittings on the regenerative system. Had this system been in operation at the works during the past financial year, Mr. Orme calculates that, on a very moderate estimate, 297 tons less coal would have been used to make the same quantity of gas, 477 tons more coke would have been produced for sale, and there would have been a considerable saving in stokers' wages. If there were now a demand for an additional 5 million cubic feet of gas, the present plant could not produce it; but with the improvement suggested, it could be made at practically the cost of the coal, after deducting the value of residuals. The Committee decided to have the report circulated among the members.

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Seville Water-Works Company.—The Directors, in their report, recommend a dividend of 2 per cent. for the year ended March 31, carrying £8320 forward. They propose to pay off the present debenture debt and create a fresh issue of £180,000, bearing interest at the rate of 5 per cent. per annum, to be repayable in 50 years out of a sinking fund to be created for the purpose. The first issue will be for £160,000; the remaining £20,000 being held in reserve for future requirements.

Lydney Water Supply.—Last Wednesday week, Col. A. G. Durnford was engaged at Lydney listening to evidence respecting an application by the Rural District Council for power to raise £10,000 for water-supply works. The need for the scheme was shown in that the present supply consists of private wells, most of which are more or less shallow, and the water is said to be contaminated. The scheme provided for the taking of water from springs in Ferneley Wood, and carrying it to reservoirs (of a capacity of 180,000 gallons) on Primrose Hill, Lydney.

Windsor Water Supply.—In view of the statement recently made reflecting on the purity of the water supplied by the Windsor Corporation, samples were taken on the 20th ult. from the wells and from the mains on Castle Hill, and submitted to Dr. J. C. Thresh, the Medical Officer of Health to the Essex County Council, who reported thereon last Wednesday to Mr. C. Sainty, the Water-Works Engineer to the Corporation. He pronounced the water to be "of a high degree of organic purity," and said the "natural processes of filtration" were so effective that the bacterial purity was quite satisfactory. Samples were also examined by the Jenner Institute, with the same result. The report was: "The water is satisfactory. There is no chemical evidence of pollution from dangerous sources."

Brighton Water Supply.—Though the new pumping-station at Mile Oak, Portslade, has been in operation for some time, it was only on Tuesday last that the formal inaugural ceremony was performed by the Mayor (Alderman J. E. Stafford, J.P.), in the presence of many members of the Town Council, and the principal Corporation officials. The new station was selected in 1898. The underground works at the present time comprise two wells, each 187 feet deep, joined by two sets of headings; one winding-shaft 6 feet in diameter and 190 feet deep; and about 1200 feet in length of headings, varying in height from 30 feet to 6 ft. 6 in., and 5 ft. 6 in. wide. The pumping-engines are of the marine type, adapted for this class of work. They are each able to pump from the wells and deliver into Brighton 2 million gallons of water per day; and the headings are yielding nearly this quantity. The total cost of the new station up to the present time has been about £50,000. Mr. Swift added, in regard to the water-works generally, that since 1875 the Committee had handed over in relief of the borough rates £138,623, and had also set aside a contingent fund of £15,400. The district extends for a distance of 13 miles; the population supplied, excluding visitors, is estimated at 175,000; and the maximum quantity of water distributed is about 7¼ million gallons per day. Several members of the Council and Corporation officials descended to the wells, and were conducted round the works by Mr. James Johnston, M.Inst.C.E., the Corporation Water-Works Engineer.

New Joint-Stock Companies.—The Farnsfield and District Gas Company, Limited, has been registered with a capital of £2000, in £1 shares, to adopt an agreement with Messrs. S. P. & J. N. Derbyshire, and to carry on the business of a Gas Company at and near Farnsfield, Nottinghamshire. There is no initial public issue. The Gandy Belt Manufacturing Company (1901), Limited, with a capital of £150,000, in £1 shares, is to adopt and carry into effect an agreement with the Gandy Belt Manufacturing Company, Limited, and Mr. D. D. Macpherson, and a second agreement with the Velvril Company, Limited, Mr. W. F. Reid, and Mr. E. J. V. Earle, for the acquisition of the undertaking and all or any of the assets and liabilities of the Gandy Belt Manufacturing Company, Limited (incorporated in 1886).

The Stroud Gas Bill, which has already received the sanction of the House of Commons, has now passed through the Committee stage in the House of Lords without opposition. The Bill authorizes the Stroud Gaslight and Coke Company to convert their existing capital, to raise further capital, to acquire additional land for the purposes of the undertaking, and to apply hereafter, if they think fit, for a Provisional Order to supply electrical energy.

At a meeting of the Tube Association, representing manufacturers in Birmingham, South Staffordshire, Lancashire, and the North of England, held at Birmingham last Wednesday week, it was decided to advance the discounts on gas, water, and steam tubes 2½ per cent. on the gross from the 1st inst. This is equivalent to 7½ per cent. reduction on gas-tubes, and 5 per cent. on steam and water tubes. Outside competition has necessitated this action.

The Wolverhampton Gas Company have decided to let on hire, at merely nominal rent, a cheap, but serviceable, class of gas cooking-stoves, suitable for working-class families. They offer to place the stoves, with all the necessary fittings attached, free; the only cost to the user being in the quantity of gas consumed. This is charged at the current rate of 2s. 9d. per 1000 cubic feet, with an addition, for the hire of the stove, of 7d. per 1000 feet of gas consumed.

The fourteenth annual dinner of the employees of the Welsbach Incandescent Gas-Light Company, Limited, took place on the 29th ult., at the Norfolk Hotel, Arundel. The party were conveyed by special train from Victoria at 8.45 a.m.; and as it did not leave for the return journey till 8.40 p.m., a good long day was spent in the ancient municipal Sussex borough. The morning was devoted to sports; and the afternoon to a cricket match, played in the Duke of Norfolk's beautiful park, by the kind permission of his Grace. Dinner was served about one o'clock; some 212 sitting down. The toast of the day—"The Welsbach Incandescent Gas-Light Company"—was cordially received. The Chairman and Vice-Chairman were Mr. J. Bartlett (in the absence of Mr. W. Divine through illness) and Mr. Garner, the Hon. Treasurer was Mr. F. Ferguson, and the Stewards were Messrs. Edwards, Collings, Bellis, and Lowe, whose efforts, for which they were heartily thanked, ensured an enjoyable day's outing.

JOSEPH AIRD
GREAT-BRIDGE,
STAFFORDSHIRE.
TUBES
AND FITTINGS
GAS, STEAM, WATER GALVANIZED-TUBES, &c.
LONDON OFFICES: 46, QUEEN VICTORIA STREET, E.C.

The Barrow Gas and Water Committee have entered into contracts for coal at a saving of 3s. 5d. per ton compared with last year.

At the last meeting of the Wigan Town Council, the salary of the Gas Engineer (Mr. J. Timmins) was advanced by £50 per annum.

The tender of Mr. C. W. Davenport has been accepted for extensions at the Delph Lane pumping-station of the Warrington Corporation Water Department. The price is £8271 10s.

The Husson acetylene plant to which reference was made in an article last week is being shown at the Glasgow Exhibition at the stand of Messrs. Finlay and Co., Limited, the Glasgow Agents.

Mr. T. W. Hutchings, whose seat on the Teignmouth District Council was recently declared vacant because a ship of which he is owner carried a cargo of coal for the Council's gas-works, was last week re-elected.

According to a recently issued circular report on the trade and commerce of Hamburg for the past year, the import of sulphate of ammonia is diminishing; the demand being largely, and in an increasing degree, covered by German production.

The tender of Mr. H. E. Buckley, of Bingley, has been accepted by the Barnsley Town Council for the construction of a service reservoir at Wortley, and for the laying of a pipe-line from Wortley to Barnsley. The amount of the contract for the former work is £7877 18s. 6d., and for the latter £5032 4s.

A fire broke out on the premises of Messrs. W. C. Holmes and Co., at Turnbridge, Huddersfield, early last Thursday morning, and did damage estimated at £2000, which is covered by insurance. The firm have, however, been able to enter into arrangements with adjoining works, and have also made the necessary repairs, by which their business will be carried on without any serious delay.

Gas exhibitions have lately been held by John Wright and Eagle Range, Limited, at Birkdale, Heaton, and Needham Market, with lectures by the Misses Jennie Barker, M. B. Terrace, and M. Lovett. The Richmond Gas Stove and Meter Company, Limited, have been taking part in a Trades Exhibition at Stockport; and Miss Smallwood has been lecturing on cooking and laundry work.

The difference between English and foreign tenders was strikingly shown at the meeting of the Manchester City Council last Wednesday, when Dr. Bishop, the Chairman of the Electricity Committee, stated, in reply to a question, that the difference in the price asked by a foreign firm and that tendered by an English firm for engines, generators, and motor generators was £26,000 in favour of the foreign firm. Out of a list of 18 English firms who had offered to make these generators and motor generators, there was only one tender which could be considered by the Committee, and the great divergence in price would be seen.

We have had sent by Messrs. John Wright and Co., of Bristol, a little waistcoat-pocket book entitled "Golden Rules of Hygiene," by F. J. Waldo, M.A., M.D. (Cantab.), D.P.H., Barrister-at-Law. It is one of the "Golden Rules" Series issued by the above-named firm; and it presents in a concise form a few salient points on air, water, the disposal of refuse, food, and infectious diseases. The author is the new Coroner for the City of London.

We have received from Messrs. P. S. King and Son, Westminster, a copy of "Local London: A Municipal Directory for the Metropolis and Suburbs." The publishers claim for it the merit of being the only work of the kind relating to Greater London; and it must be acknowledged that the 211 pages occupied with ordinary matter (interspersed with advertisements) contain a great deal of information, in the preparation of which, the compilers state in their Introduction, "every care has been taken to ensure accuracy." Moreover, we are assured by the title-page that it has been "compiled from the latest official records." It is only possible to test this in a general way by referring to the book; and, speaking for the few particulars relating to gas companies given on p. 61, we must confess to feeling very strongly that their efforts have not been successful—a correction being needed in respect of all six Companies noticed. If the compilers wish, as they apparently do, that "Local London" should be a local "Whitaker," they must keep as watchful an eye over official changes as do the conductors of that now indispensable almanac. Their little "Directory" will then be a really useful addition to the list of books of the kind now published.

A meeting of gas strip manufacturers was held at Birmingham last Thursday—Sir Benjamin Hingley presiding—to consider the question of selling prices and the formation of an Association for the better organization of the trade. A few years ago, an Association existed on a voluntary basis, but it collapsed during the period of depression, and since then prices have gone from bad to worse until at the present time they are altogether unremunerative. Recently an advance of 5s. a ton was obtained on gas strip; but this only raised the minimum to £6 7s. 6d., which, it is said, scarcely covers the cost of production. A decided effort is now being made to bring the manufacturers into co-operation; and it hoped to unite all the districts in which this class of iron is produced. We learn that the scheme submitted is similar to that which prevails in the tube trade, and embraces a restriction of the output regulated by the average production of the various firms over a given period, and penalties will be enforced against firms who do not comply with the rules. The Association has not yet been definitely constituted; but we believe the number of signatures obtained to the agreement is such as to encourage the hope that the bulk of the trade will take part in the movement.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

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WALTER KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.

GAS PURIFICATION AND CHEMICAL COMPANY, LIMITED.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale than all other Oxides combined. Purity and uniformity of quality guaranteed.

JOHN WM. O'NEILL, Managing Director,
160, 161, & 162, PALMERSTON BUILDINGS,
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LONDON, E.C.

ANDREW STEPHENSON, AGENT. All communications *re* Oxide to the Company as above.

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"VOLCANIC" FIRE CEMENT.

Resists 4500° Fahr. Best for use in GAS-WORKS.

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Offices: Commercial Buildings, LEEDS.
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PATENTS FOR INVENTIONS.

Messrs. J. C. CHAPMAN & CO., Chartered Patent Agents, ADVISE ON ALL MATTERS CONNECTED WITH ABOVE.
Information and Handbook on application,
70, CHANCERY LANE, LONDON, W.C.

SULPHURIC ACID for Sale.

BROTHERTON AND CO., Chemical Manufacturers,
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM; and 45 & 47, Westminster Bridge Road, LONDON, S.E.
First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.
Telegraphic Addresses:
"Braddock, Oldham." "Metrique, London."

BY the adoption of Cripps's Bye-Pass VALVES inside your Purifiers, you can relieve the Back-Pressure in the Lower Tiers when the Purifying Material gets hard. They are extremely useful and economical.
Sole Makers: C. & W. WALKER, LIMITED, Midland Iron-Works, Donnington, near Newport, SHROPSHIRE.

AMMONIACAL LIQUOR wanted.

BROTHERTON AND CO., Ammonia Distillers.
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

NEW GAS PLANT CEMENT.

JOHN E. WILLIAMS AND CO.,
VICTORIA PAINT WORKS,
MANCHESTER.
For all Joints in connection with Oil Gas Plant and Sulphate Plant.
For all Gas Joints.
For all Tar Joints.
For all Ammonia Joints.

PRACTICAL RETORT SETTERS.

GEORGE NUTTALL & CO., 32, Havelock Road, Saltley, Birmingham.
Regenerator or other Furnaces erected to Engineers' own Designs. Best Work Guaranteed. Please write for Estimates.

OXIDE OF IRON OF FINEST QUALITY.

BALE'S Special Fire Cement should be used to keep Retorts, Furnaces, &c., in good repair during the heavy Winter Work.
Send for full Particulars to
BALE & Co., 120 & 121, NEWGATE STREET, LONDON, E.C.
Telegrams: "BOGORE, LONDON."
Telephone "277 HOLBORN."

SULPHATE OF AMMONIA

SATURATORS and LEAD WORK for Sulphate of Ammonia Plants.
For REPAIRS or ALTERATIONS, ring up "0848 BOLTON," or Telegraph "SATURATORS, BOLTON."
Largest Practice and most Up-to-Date Works in Britain.
JOSEPH TAYLOR AND CO., Central Plumbing Works, Victoria Square, BOLTON.

"FRASER'S Excelsior Fire Proof CEMENT" in 28 lbs., 56 lbs., and Cwt. Kegs.
For Particulars and Prices, apply M. WELLS AND CO., Hardman Street Works, Deansgate, MANCHESTER.

GAS TAR wanted.

BROTHERTON AND CO., Tar Distillers.
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

HYDRATED OXIDE OF IRON.

PREPARED from Pure Iron.
Twice as Rich as Bog Ore.
Gives no Back Pressure.
The Cheapest in the Market.
Can be Lent on Hire.
Can be Exchanged for Spent Oxide.
READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

SADLER & CO., Ltd., Middlesbrough, Tar Distillers and Tar Colour Manufacturers. BENZOL specially prepared for Gas Enrichment free from Sulphur. Pure Hydrated OXIDE OF IRON for Purifying Gas either for Sale or Lent on Hire. Always Buyers of GAS TAR and AMMONIACAL LIQUOR.

PENNY-IN-THE-SLOT WORK.

H. GREENE & SONS, Ltd., are prepared to give QUOTATIONS to Gas Companies or Corporations for FITTING UP COMPLETE and CARRYING OUT the WORK in its entirety, either in Iron or Compo.
19, Farringdon Road, London, E.C.
Telegrams: "Luminosity."

TO GAS AND WATER OFFICIALS.

HIGH-CLASS CYCLES at Reasonable and LOW PRICES. Guaranteed and sent on approval. For Cash or Gradual Payments. Catalogue post free. Old Machines Exchanged or Repaired.
Melrose Cycle Company, Coventry.

PREPAYMENT GAS-METERS.

H. WATERFALL, General Gas-Fitter, No. 9, Church Lane, Aston, Birmingham, is prepared to give QUOTATIONS to Gas Companies or Corporations for Pipe work (either in Iron or Compo.), Fittings, and Stoves complete, or Labour only.

METER Reader, Gas, Situation wanted by person with long experience, including Account Books, &c. (Gas or Electric). Excellent Testimonials.
Address No. 3715, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

ADVERTISER (24 Years of age), vacating Situation as SECRETARY to a Gas Company, seeks similar post. Could assist in Management of Works if required. Thorough Experience. Excellent Testimonials. Satisfactory reasons for changing.
Address No. 3714, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

WANTED, Practical Retort Setters, used to Regenerative, Inclined, and other Settings.
Apply, by letter, to No. 3717, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

TRAVELLER (GAS-STOVE TRADE).

WANTED for the Provinces. Must have good experience and influence.
Apply, by letter, with all Particulars to No. 3709, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

WANTED, a Blacksmith and Fitter used to Gas-Works. Must be able to lay Services. Constant Employment, 30s. per week.
Apply, with References, stating Age and Experience, to Wm. Palgrave Brown, Gorleston and Southtown Gas Company, Great Yarmouth.

WANTED, a reliable leading Stoker who must be competent to look after Engine and Boiler. Permanency to steady Man. Wages 33s. Must have good Character.
Apply, stating Age and whether Married or Single, to Manager, Gas-Works, Newmarket.

RETORT Setter and Bricklayer wanted. Permanency for a good Man. Must be used to Regenerative Furnaces (Winstanley's for preference).
Apply, stating Wages required, Experience, and present Employment, to Mr. S. O. Stephenson, Engineer and Manager, Gas-Works, Tipton.

WANTED, One or Two thoroughly reliable and steady Men as STOKERS. Must be good Shovel Chargers, and used to Engine and Exhauster.
For further Particulars apply to H. C. Shepherd, Manager and Secretary, Gas-Works, Swindon.

WANTED, a Man for Sulphate Making. Must be capable of Working the Continuous System, and willing to make himself useful in a Gas-Works. Wages 6s. per Shift in Sulphate Works, and 5s. per Shift in Yard.
Apply to the Manager, Gas Company, Richmond, Surrey.

FOREMAN OVER PURIFIERS.

REQUIRED, at a Provincial Gas-Works, a competent intelligent Man, acquainted with modern methods of Purifying. Age from 30 to 40.
Apply, stating Wages required and References, to No. 3712, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

WANTED, a Manager for Gas and Water Works. Make of Gas 10 millions. Applicants must have a good knowledge of Plumbing and Gas-Fitting and the working of Generator Furnaces. Cottage, with Gas, Water, and Coal free.
Apply, by letter, giving Age, Experience, and Salary required, to No. 3711, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

WANTED, a competent Gas Engineer to go abroad (30 to 40 years of age), capable of managing a Company carbonizing about 40,000 Tons of Coal annually.
Answers to be sent on or before July 16, stating Salary required (which will be liberally adjusted to a suitable candidate). References, and past Experience, to No. 3716, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

REQUIRED, by the Woolton Gas Company, a Young Man as ASSISTANT to the present Manager. It will be necessary for Applicants to have a thorough knowledge of the routine of a Gas-Works in all its branches, where the make of Gas is about 23 Millions per annum.
Salary to commence, £80 per annum.
Applicants must state Age, Qualification, and References, which must be sent not later than July 16, 1901, endorsed, "Application for Assistant Manager," and addressed to W. W. Sandbrook, Esq., Chairman of the Woolton Gas Company, Woolton, near Liverpool.

ILFORD GAS COMPANY.

WANTED, a smart, intelligent young Man as AUTOMATIC METER COLLECTOR.
Applications, endorsed "Automatic Meter Collector," stating Age, Experience, and Wages required, to be sent to the undersigned not later than Monday, July 15, 1901.
J. H. Brown,
Engineer and Manager.
Gas-Works, Ilford, E.,
July 5, 1901.

ILFORD GAS COMPANY.

THE Directors of the above Company require the services of a smart, intelligent young Man as OUTDOOR INSPECTOR.
Applicants must have had considerable experience in Main and Service laying, Gas-Meter and Gas-Stove fixing, and also be capable of superintending Internal Fitting of every description.
Experience with High-Pressure Incandescent Gas Lighting will be considered an advantage.
Applications, endorsed "Outdoor Inspector," stating Age, Experience, and Wages required, must be sent in to the undersigned not later than Monday next, July 15, inst.
J. H. Brown,
Engineer and Manager.
Gas-Works, Ilford, E.,
July 5, 1901.

TO BE LET on Lease. Possession the 25th of March, 1902. The Hedinghams (Essex) Gas-Works as a going concern, with Manager's Cottage.
Apply to the Secretary, Castle Hedingham, Essex.

CONDENSERS FOR SALE.

WANTED, Offers for Four Annular CONDENSERS, with 8-inch Connections, 14 ft. 6 in. High. Inner Tubes 13 inch; Outer Tubes 21 inch, together with Overflow-Pipe and Seal-Pots.
Apply to G. Moat, Gas-Works, Purston, Pontefract.

FOR SALE — Wilton's Furnaces for Three Two-Flued LANCASHIRE BOILERS (Four-Way Tubes) complete.
D. & S. Ockleston, Mill Bank Paper Mills, near Manchester.

FOR SALE, Cheap—Two Purifiers, 8 ft. square by 4 ft. deep, in good condition, with Valves, Connections, and Lifting Gear.
INQUIRIES for all kinds of SECOND-HAND GAS PLANT will also be esteemed by Saml. While and Son, 60, Queen Victoria Street, London, E.C.

TO BE SOLD—
SINGLE GASHOLDER, 22 ft. by 10 ft. Four Columns
One PHOTOMETER by Sugg & Co., with 10-Candle Pentane Apparatus.
Write J. Wright, Bridge House, Blackfriars, E.C.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
J. F. Blakeley Gas Engineer, Thornhill, Dewsbury.

FOR SALE, VERY CHEAP.

FIVE 21 in. by 15 in. Oval Self-Sealing MOUTHPIECES, by Tangyes; also Two Wrought-Iron Lengths of HYDRAULIC MAIN, 9 ft. 6 in. by 18 in. by 18 in. □ and 8 ft. 10 in. by 16 in. by 16 in. inside, suitable for Fives or Sixes, together with Valves, Dips, and Arch Pipes. The whole are in perfect condition, and may be seen on application to the undersigned.
Any portion of the above will be sold separately.
J. H. Cornish,
Secretary and Manager.
Bridport Gas Company, Limited.

ABERTILLERY URBAN DISTRICT COUNCIL.
(Gas Department.)

OFFERS are required for Two Second-Hand PURIFIERS with Lids, and two Four-Way Valves complete.
Purifiers are 6 feet square, and 4 feet in depth. Two of the Plates have been chipped at the angles in removal.
Jas. M'Bean,
Manager.

YEADON AND GUISELEY GAS COMPANY.

FOR SALE—One Second-hand Purifier, 14 ft. square, 4 ft. 6 in. deep, with Four-way Valve, 12-inch diameter Connections, Two Floors, Wood Grids, and Travelling Lift by Cockey and Sons. The whole in really good condition. Can be seen at the Gas-Works, Yeadon, near Leeds.
Offers may be made to the undersigned, at his Office in Yeadon.
By order,
Edward Lister,
Secretary and Manager.
Gas Offices, Yeadon,
June 18, 1901.

FENNY STRATFORD GASLIGHT AND COKE COMPANY, LIMITED.

FOR SALE—Two 6 ft. and one 4 ft. 6 in. length of HYDRAULIC MAIN U shape. Size 13 in. by 11 in. Eight OVAL and Six ROUND MOUTHPIECES; Doors and Cramps complete. Also Eight lengths of 4-inch ASCENSION-PIPES. Second-hand, but in good condition.
Apply to the Secretary, Thomas Best, Fenny Stratford, Bletchley.

FOR SALE—Cheap to Clear.
One GASHOLDER, 50 ft. by 16 ft., 12 Years old.
One ,, 25 ft. by 10 ft., 6 ,,
One ,, 15 ft. by 10 ft., 6 ,,
Erected complete. New Steel Tanks supplied.
Six Annular CONDENSERS, 30 feet high. Perfect.
Two PURIFIERS, 22 ft. by 8 ft., complete and good.
Four ,, each 10 ft. and 6 ft. square.
Two ,, each 8 ft. and 6 ft. square.
Other Plant and Sizes in Stock. Photometers, Gauges, &c.
Apply J. Firth Blakeley & Co., Thornhill, Dewsbury.

PURIFIERS FOR SALE.

THE Directors of the Lichfield Gas Company invite TENDERS for the purchase *in situ* of Four 10 feet square PURIFIERS, with Wet Centre-Valve, 10-inch Connections, and two Hydraulic Cranes for lifting the Covers. The whole Plant is in good condition, and may be seen on application to
Frederick Key,
Manager.
Gas Office, Lichfield, Staffs.,
July 6, 1901.

GAS COKE FOR SALE.

THE Directors of the Lichfield Gas Company invite TENDERS for 1000 Tons of GAS COKE into Buyer's Waggons at the City Station or Boats at the Canal Wharf—200 Tons for immediate delivery, and the balance at the rate of 100 Tons per month for the ensuing Eight Months.
Any further Particulars on application to
Frederick Key,
Manager.
Gas Office, Lichfield, Staffs.,
July 6, 1901.

TIPTON GAS-WORKS.

COAL CONTRACTS.

THE Gas Committee of the Tipton Urban District Council are prepared to receive TENDERS for the supply of GAS COAL for a period of One Year, to be delivered, carriage free, to their Gas-Works Siding, L. & N.W. Rly., at Tipton.
Specifications and Forms of Tender may be obtained at the Gas-Works, on application to Mr. S. O. Stephenson, the Engineer and Manager.
Tenders to be sent to me, the undersigned, not later than Ten a.m. on Saturday, the 20th of July, 1901, sealed and endorsed "Tender for Gas Coal."
The Committee do not bind themselves to accept the lowest or any Tender.
By order,
John W. Waring,
Clerk to the Council.
Public Offices, Tipton,
June 24, 1901.

TIPTON GAS-WORKS.

TAR CONTRACTS.

THE Gas Committee of the Tipton Urban District Council are prepared to receive TENDERS for the purchase of the surplus TAR made at their Gas-Works, for a period of One Year from the 1st day of July, 1901.
The Tar will be delivered free into Contractor's boats on the Canal.
The Purchaser will have to enter into an Agreement with the Council for the due performance of his Contract.
Sealed Tenders, stating Price per Ton for Tar, to be sent to the undersigned on or before the 20th day of July, 1901, endorsed "Tender for Tar."
The Committee do not bind themselves to accept the highest or any Tender.
Further Particulars may be had on application to Mr. S. O. Stephenson, the Engineer and Manager.
By order,
John W. Waring,
Clerk to the Council.
Public Offices, Tipton,
June 24, 1901.

KENT WATER-WORKS.

TENDERS FOR COAL.

THE Directors of the Kent Water-Works Company invite TENDERS for the supply of SCREENINGS from the best Durham Coal at their Pumping-Stations at Crayford, Orpington, and Wilmington, Kent, for One Year.
Approximate weekly quantities: Crayford, 55 to 80 Tons; Orpington, 40 to 50 Tons; Wilmington, 70 to 120 Tons.
The Coal must be delivered in good and proper condition, and must evaporate not less than 7 lbs. of Water for each pound of Coal, and be free from Slag or other Mineral or Earthy Matter. The percentage of Ash and Clinker to be adopted as the agreed limit will be specified.
Payments monthly upon Engineer's Certificate.
The Directors do not bind themselves to accept the lowest or any Tender.
The Draft Contract can be inspected and other Particulars obtained at the Company's Offices, Mill Lane, Deptford.
Tenders, marked "Tender for Coal," to be transmitted under seal on or before Saturday, the 13th of July, to
A. Dickson, Jun.,
Secretary of the Company.
July 3, 1901.

ST. ANNE'S-ON-THE-SEA GAS COMPANY.

THE Directors invite Tenders for the supply of 4000 Tons of best screened GAS COAL, to be delivered as required during the period from Aug. 1, 1901, to June 30, 1902.

Tenders, endorsed "Coal," to be sent to the undersigned not later than the 20th inst.

WILLIAM H. NUTTER,
Secretary and Manager.

Gas Offices, St. Anne's-on-the-Sea,
July 4, 1901.

SURPLUS TAR.

THE Gas Committee of the Corporation of Coventry are prepared to receive TENDERS for the purchase of the surplus TAR produced at their Works during the Twelve Months commencing Aug. 1, 1901, also for the PETROLEUM RESIDUUM produced during the Twelve Months from Oct. 1, 1901.

Make of Tar, about 2000 Tons per annum.

Tenders, stating Price per Ton delivered into Boat, to be sent to the Manager, marked "Tender for Tar," not later than July 15.

The Committee do not bind themselves to accept the highest or any Tender.

GEO. WINSTANLEY, M.Inst.C.E.,
Manager.

Gas-Works, Coventry,
July 4, 1901.

CORPORATION OF CLONMEL.
(GAS DEPARTMENT.)

TENDERS FOR GAS COAL.

THE Gas Committee of the above-named Corporation are prepared to receive TENDERS for the supply of DURHAM or any other good GAS COAL free from Sulphur, Bats, Bind, Refuse and Dirt, for One, Two, or Three Years respectively, from the 30th of June, 1901. The estimated Yearly Consumption is about 3000 Tons.

Coal to be delivered as required in Waterford by sailing ships, which will be discharged at the rate of 30 Tons per working day.

The Committee reserve the right to accept Tenders for the whole or any portion of the quantity offered, and do not bind themselves to accept the lowest or any Tender.

Sealed Tenders, endorsed "Tender for Gas Coal," to be delivered on or before the 21st of July, 1901, addressed to the Secretary, Gas-Works, Clonmel.

Gas Offices, Clonmel,
June 26, 1901.

OSWALDTWISTLE URBAN DISTRICT COUNCIL.

TENDERS FOR TAR AND LIQUOR.

THE above Council invite Tenders for the TAR and LIQUOR produced at the Gas-Works for One Year from the 31st day of July, 1901.

The quantity of Coal carbonized is about 4000 Tons per annum.

Further Particulars may be obtained on application to the Manager, Mr. T. Loxley, at the Gas-Works, Church, near Accrington.

Sealed Tenders, endorsed "Tender for Tar and Liquor," must be sent to the undersigned on or before Monday, the 29th inst.

No Forms of Tender issued.

B. T. WESTWELL,
Clerk to the Council.

Town Hall, Oswaldtwistle,
July 8, 1901.

OSWALDTWISTLE URBAN DISTRICT COUNCIL.

TENDERS FOR GAS COAL.

THE above Council invite Tenders for the supply of 3500 Tons of screened GAS COAL during the Year ending the 31st of July, 1902.

Further Particulars may be obtained on application to the Manager, Mr. T. Loxley, at the Gas-Works, Church, near Accrington.

Sealed Tenders, endorsed "Tender for Gas Coal," must be sent to the undersigned on or before Monday, the 29th inst.

No Forms of Tender issued.

B. T. WESTWELL,
Clerk to the Council.

Town Hall, Oswaldtwistle,
July 8, 1901.

URBAN DISTRICT COUNCIL BOROUGH OF NEWRY.

TENDERS FOR GAS COAL.

THE Gas Committee of the above Council invite TENDERS for the supply of from 3000 to 3500 Tons of best screened GAS COAL for a period of Twelve Months, to be delivered in such quantities and at such times as may be required by the Committee, and to weigh 20 cwt. to the ton over the Gas Committee's Weighbridge at their Works (said Machine regularly inspected by officer under "Weights and Measures Act"), and delivered *free ex* Ship or Steamer at Albert Basin, Newry.

The Coal to be Fresh Wrought, Dry, and Free from Hards, Smudge, Dirt, Shale, Pyrites, or other objectionable Matter for Gas Making.

Further Particulars may be obtained from Mr. A. Gibb, Manager.

Sealed Tenders, endorsed "Tender for Coal," specifying the description and quality of the Coal, and where raised, to be addressed to John H. Small, Esq., Chairman, and delivered to the undersigned not later than Eleven a.m., on Friday, the 12th of July.

The Committee reserve to themselves the right to accept the whole or any portion of any quantity offered, and do not bind themselves to accept the lowest or any Tender. They also reserve the power to decline acceptance of any Coal *not equal in their belief* to that contracted for.

By order,
THOMAS WATT,
Secretary for Gas Committee.

Gas-Works Office, Newry,
June 29, 1901.

BENZOL WANTED.

THE Holywood Gas Company, Limited, County Down, invite TENDERS for 500 to 1000 Gallons purified 90 per cent. BENZOL, delivered at their Works in such quantities as may be required between the months of September, 1901, and March, 1902, in perfectly tight Drums containing 40 to 80 gallons each.

TENBY GAS CONSUMERS' COMPANY, LIMITED.

THE Directors of the above Company invite TENDERS for the supply of about 3000 Tons of best HOUSE and GAS COAL, as required, from the 1st of August, 1901, to the 30th of June, 1902.

Particulars as to deliveries, and Form of Tender, may be obtained on application to the undersigned.

Sealed and endorsed Tenders to be addressed to the Secretary, C. W. R. Stokes, Esq., not later than the 20th inst.

ALFRED H. BROOKMAN,
Engineer and Manager.

Tenby, July 1, 1901.

GLASGOW CORPORATION.
(GAS DEPARTMENT.)

TENDERS FOR METERS.

THE Corporation invite Tenders for the supply of such METERS as may be required by them for Twelve Months from date of acceptance.

Forms of Tender may be obtained on application to Mr. Foulis, the Manager, at the Gas Office, 45, John Street, Glasgow; and sealed Offers, marked "Tender for Gas-Meters," addressed to the Subscriber, will be received by him on or before Tuesday, the 23rd curt.

The Corporation do not bind themselves to accept the lowest or any Offer.

J. D. MARWICK,
Town Clerk.

City Chambers, Glasgow,
July 6, 1901.

BROADSTAIRS GAS COMPANY.

THE Directors of the above Company invite TENDERS for the work and material required in the construction of a RETORT STACK and RETORT SETTINGS. Also SCOOP CHARGING APPARATUS; and the supply and erection of a complete ROOF over their Retort-House.

Specifications and Prints may be obtained on application to the undersigned, upon payment of One Guinea, which will be returned on receipt of a *bonâ-fide* Tender.

Tenders, addressed to the undersigned, to be sent in not later than July 22, 1901.

The Directors do not bind themselves to accept the lowest or any Tender.

F. HIGGINSON,
Engineer, Manager, and Secretary.

Gas Office, Alexandra Road,
Broadstairs.

BOROUGH OF HEYWOOD.

THE Gas Committee invite Tenders for the supply of

1. COAL AND CANNEL.
2. LIME.
3. TUBES AND FITTINGS.
4. SULPHURIC ACID.

Specification and Form of Tender may be obtained from Mr. W. Whatmough, Gas Manager.

Contractors tendering for this work must pay their Workpeople at least the Standard or Trade Union Rate of Wages, and observe the Trade Conditions which attach to the various kinds of work for which the Tender is sent in.

Sealed and endorsed Tenders to be sent to me not later than Tuesday, July 16, 1901.

By order,
GEORGE G. BOUCHIER,
Town Clerk.

Municipal Buildings, Heywood,
June 19, 1901.

BOROUGH OF DARLINGTON.
(GAS-WORKS DEPARTMENT.)

TENDERS FOR GAS COAL.

THE Gas and Electric Lighting Com- mittee invite TENDERS for the supply of either 15,000 or 30,000 Tons of freshly wrought GAS COAL, delivered at the Gas-Works Siding during the ensuing Six or Twelve Months as may be required.

Further Particulars may be obtained from Mr. Frank P. Tarratt, Gas-Works Engineer, Darlington.

Tenders, endorsed "Tender for Gas Coal," to be delivered at my Office, Houndgate, Darlington, not later than July 18.

No pledge is given that the lowest or any Tender will be accepted.

HENRY G. STEAVENSON,
Town Clerk.

Town Clerk's Office,
Darlington, July 9, 1901.

GAINSBOROUGH URBAN DISTRICT COUNCIL.
(GAS DEPARTMENT.)

TENDERS FOR GAS COAL.

THE Gas Committee of the above Council invite TENDERS for the supply of 5000 Tons of best GAS COAL (Screened, Unscreened, or Nuts), to be delivered at the G.N. or G.C. Railway Stations, Gainsborough, between the 1st of August, 1901, and the 30th of June, 1902, in such quantities, monthly, as may be required.

Sealed Tenders, endorsed "Tender for Gas Coal," giving full Particulars of the Coal offered, and to be addressed to the Chairman of the Gas Committee, must be delivered at the Gas-Works, Gainsborough, not later than the 16th of July next.

The Committee do not bind themselves to accept the lowest or any Tender.

JOHN BALDWIN,
Manager.

Gas-Works, Gainsborough,
July 6, 1901.

TENDERS are invited for the supply of about 1250 Yards of 10-inch CAST-IRON GAS MAINS and CONNEXIONS for the Corporation Gas Department, Glastonbury.

Particulars may be obtained on application to the Consulting Engineer, Mr. W. A. Valon, 140, Temple Chambers, E.C.

Tenders must give Price of Pipe per Yard and Connections per Ton, and should be sent, before the 19th inst., to Mr. JOHN BISHOP, Incorporated Accountant, GLASTONBURY, Clerk to the Gas Committee.

HINCKLEY URBAN DISTRICT COUNCIL.

THE Gas Committee invite Tenders for the supply of COAL, LIME, and SULPHURIC ACID; also for the purchase of TAR.

Full Particulars and Form of Tender may be obtained from Mr. Fred Lee, Gas Manager.

Endorsed Tenders to be sent to me not later than Saturday, July 20, 1901.

A. S. ATKINS,
Clerk.

Hinckley, July 5, 1901.

GAS COKE.

THE Gas Committee of the Stoke-upon- Trent Corporation invite TENDERS for their surplus COKE (Estimated Quantity 4000 to 5000 Tons) over the period extending to the 30th of June, 1902.

Delivery can be made by Canal or North Stafford Railway (Pratts Sidings).

Sealed Tenders, to be endorsed "Coke," and sent in not later than noon, July 18, 1901, addressed to the Chairman, F. Geen, Esq., J.P., Gas Offices, Wharf Street, Stoke-upon-Trent.

WM. PRINCE,
Engineer and Manager.

THE Llandudno Urban District Council are desirous of receiving TENDERS for BENZOL for the ensuing Twelve Months.

The approximate quantity required is 3000 Gallons, which must be delivered in such quantities and at such times as may be ordered.

Tenders must be sent in to the undersigned on or before Monday, the 5th day of August, 1901.

The Council do not bind themselves to accept the lowest or any Tender.

ALFRED CONOLLY,
Clerk to the Council.

Church Walks, Llandudno,
July 4, 1901.

EAST RETFORD CORPORATION.
(GAS UNDERTAKING.)

THE Committee of the above invite TENDERS for the purchase of the surplus TAR and AMMONIACAL LIQUOR produced at their Works during the Year ending June 30, 1902.

Further Particulars may be had on application to the undersigned.

Tenders to be sent in on or before the 15th inst. to the Chairman of the Gas Committee, endorsed "Tender for Tar" or "Liquor."

J. B. FENWICK,
Engineer and Manager.

Gas and Water Offices,
East Retford.

BOROUGH OF CONGLETON.

TENDERS FOR GAS COAL.

THE Gas Committee of the above Cor- poration invite TENDERS for the supply of 4000 Tons of best screened GAS COAL, or Washed NUTS, or BURGY, and 250 Tons of best screened CANNEL or CANNEL NUTS, to be delivered during the next Twelve Months.

Forms of Tender are not supplied.

Sealed and endorsed Tenders, addressed to the Chairman of the Gas Committee, to be delivered at the Town Clerk's Office, not later than Monday, the 22nd of July current.

WM. ORME,
Manager.

Gas-Works, Congleton,
July 1, 1901.

BOROUGH OF WALLINGFORD.

THE Corporation of Wallingford invite TENDERS for the supply of about 1100 (Eleven Hundred) Tons of GAS COAL, to be delivered at the Works at Wallingford, at such times, and in such quantities as may be directed, between the 1st of August, 1901, and the 31st of July, 1902.

Form of Tender and further Information may be obtained from the undersigned.

Tenders, endorsed "Tender for Coal," to be sent to the undersigned not later than the 13th of July, 1901.

The Corporation do not bind themselves to accept the lowest or any Tender.

FRANCIS E. HEDGES,
Town Clerk.

Town Clerk's Office,
Wallingford, June 26, 1901.

NEWCASTLE AND GATESHEAD WATER COMPANY.

TO BE SOLD by Auction, in the Board- Room of the Company's Offices, Pilgrim Street Newcastle-on-Tyne, on Tuesday, the 16th of July, 1901, at Half-past Twelve o'clock precisely, by Mr. Charles A. Joel, in such Lots as are provided for in the Company's Act of 1894—

FIFTY THOUSAND POUNDS OF FIVE PER CENT. PREFERENCE STOCK (1894).

Printed Particulars and Conditions of Sale may be had at the Company's Offices; and Messrs. George Armstrong and Sons, Solicitors, Newcastle-on-Tyne; or of the Auctioneer, 66, New Bridge Street, Newcastle-on-Tyne.

GEORGE SMITH,
Secretary and General Manager.

Newcastle-on-Tyne,
June 11, 1901.

BOROUGH OF ILKESTON.

THE Gas Committee are open to consider TENDERS for the supply and delivery of from 8000 to 8500 Tons of GAS COAL or NUTS.

Sealed and endorsed Tenders to be delivered to Wright Lissett, Esq., Town Clerk, Ilkeston, before July 12 next.

The Committee do not pledge themselves to accept the lowest or any Tender; and reserve their right to divide up the quantities offered.

Forms of Tender and any further Particulars may be had of

F. C. HUMPHRYS,
Engineer and Manager.

Gas-Works, Ilkeston,
June 24, 1901.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his AUCTIONS of STOCKS and SHARES in London, Suburban, and Provincial Gas and Water Companies are held PERIODICALLY, at the Mart, Tokenhouse Yard, E.C.

He also undertakes the issuing by AUCTION of GAS and WATER STOCKS and SHARES under Parliamentary Powers.

Terms for issuing such Capital, and also for including Gas and Water Stocks and Shares in these periodical Sales, can be obtained on application at Mr. ALFRED RICHARDS' OFFICES, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the

ROMFORD GAS AND COKE COMPANY, LIMITED.

600 £5 FULLY-PAID "B" SHARES.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Monday, July 15, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the

BOURNEMOUTH GAS AND WATER COMPANY.

174 £10 "B" SHARES.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Monday, July 15, at Seven o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the

KINGSTON-UPON-THAMES GAS COMPANY.

£5800 FOUR PER CENT. DEBENTURE STOCK.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Monday, July 15, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the

SOUTHEND GAS COMPANY.

£5000 NEW ORDINARY STOCK
AND
£5500 FOUR PER CENT. PERPETUAL DEBENTURE STOCK.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, July 30, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

YEADON AND GUISELEY GASLIGHT AND COKE COMPANY.

ISSUE OF £2000 ORDINARY NEW "B" STOCK.

THE Directors invite Tenders for the whole or any part of £2000 ORDINARY NEW "B" STOCK of the said Yeadon and Guiseley Gaslight and Coke Company, being a portion of the additional Capital of £30,000 authorized to be raised by the Yeadon and Guiseley Gas Act, 1880.

The Sliding-Scale has been applied to the Capital of the said Company by the Yeadon and Guiseley Gas Act, 1899, and under such Act the above-mentioned Stock will be entitled to a Standard Dividend of 7 per cent., provided the Standard Price fixed by the said Act of 3s. per 1000 cubic feet is charged for Gas by the Company. The said Act contains provisions for the increase or decrease of the said Standard Rate of Dividend in the event of the price charged for Gas by the Company being below or above the said Standard Price.

Prior to the application of the Sliding-Scale by the said Yeadon and Guiseley Gas Act, 1899, the Company were authorized to pay Maximum Dividends of 10 per cent. on the "A" Stock and 7 per cent. on the "B" Stock, and to charge a maximum price of 5s. per 1000 cubic feet for Gas. The Company for many years past paid the Maximum Rates of Dividends, and during several Years charged the net Price of 2s. 8½d. per 1000 cubic feet for Gas. Owing to the great rise in the price of Coal last Year, the Company charged a net price of 3s. per 1000 cubic feet for Gas; but they hope to be able shortly to reduce the Price again.

The Directors invite Tenders for the whole of the said Stock or for any portion thereof not less than £10 or any multiple of £10, subject to the Provisions of the Yeadon and Guiseley Gas Acts, 1868 to 1899, and to the Conditions of Sale.

Tenders must be sent in on or before Wednesday, the 31st day of July, 1901.

Forms of Tender, with Particulars and Conditions of Sale, may be obtained on application to the Secretary of the Company at the Gas-Works, Yeadon, near Leeds, or to

WATSON, SON, AND SMITH,
Solicitors for the Company.

11, Cheapside, Bradford.

ORIENTAL GAS COMPANY, LIMITED.

NOTICE is Hereby Given that an EXTRAORDINARY GENERAL MEETING of the Oriental Gas Company, Limited, will be held at the Offices of the Company, Finsbury House, Blomfield Street, in the City of London, on Wednesday, the 17th day of July, 1901, at Twelve o'clock, noon, precisely, when the subjoined Resolution, which was passed at the Extraordinary Meeting of the Company, held on Wednesday, the 26th day of June, 1901, will be submitted for confirmation as a Special Resolution:—

"That the new Regulations already approved by this Meeting, and for the purpose of identification subscribed by the Chairman thereof, be, and the same are hereby, approved, and that such Regulations be, and they are hereby, adopted as the Regulations of the Company to the exclusion of all the existing Regulations thereof, whether expressed in the Deed of Settlement dated the 25th day of April, 1853, or in Resolutions which have from time to time been passed since the formation of the Company, or otherwise."

By order of the Board,
H. J. LUFF,
Secretary.

Finsbury House, Blomfield Street,
London, E.C., July 8, 1901.

SALE OF GAS STOCK.

THE Hastings and St. Leonards Gas Company, pursuant to their Acts of 1883 and 1899, invite TENDERS for 3½ per cent. CONVERTED STOCK, in multiples of £10, sufficient to raise, with Premiums on issue, £24,201 17s.—the balance of the Ordinary Capital authorized by the Company's Act of 1883—to be sent to Mr. A. E. Young, Bank Buildings, Hastings, the Secretary of the Company, on or before the 31st of July next.

This Stock, under the Sliding-Scale Clauses, and at the present price of Gas charged to the Consumers, is entitled to an additional 1½ per cent.; thus making it at the present prices equivalent to a 5 per cent. Stock.

The whole amount payable, including Premium, will have to be paid to the Company's Account at the London and County Bank, 21, Lombard Street, E.C., or at the Hastings Branch, on or before the 31st day of August next; and the new Issue will be entitled to its first Dividend from that date to the 31st of December, 1901, after the declaration of Dividend in March next.

No Tenders under par will be accepted.

Tenders may be made for any amount of Stock in multiples of £10, and two or more different Tenders at different prices may be sent in by any Applicant.

Forms of Tender and any further Particulars may be had of the Secretary.

A. E. YOUNG,
Secretary to the Hastings and St. Leonards Gas Company.

Bank Buildings, Hastings.

ALL PARTS FOR

GAS-METERS,

INDICES, CRANKS, WORMS, &c.

PREPAYMENT ATTACHMENTS.

Supplied by the

Tourtel Manufacturing Co., Ltd.,

146A, QUEEN VICTORIA STREET, E.C.

HEATHCOTE GAS COAL.

Rich in Illuminating Power and Yield of Gas. Above the Average in Weight and Quality of Coke.

Maintains a High Standard in Residuals.

THE GRASSMOOR CO., LD.,

CHESTERFIELD.

WELDON MUD

FOR

GAS PURIFICATION.

For use in the

RECOVERY OF SULPHUR,

ALSO

Removal of last Traces of SULPHURETTED HYDROGEN in catch position.

Full Particulars on application to the Patentees:

GAS DESULPHURIZATION CO.,

— LIMITED. —

1, FENCHURCH AVENUE, LONDON, E.C.

NITRATE of Thorium and Cerium. FABRIK CHEMISCHER PRAEPARATE VON STHAMER, NOACK, AND CO., HAMBURG.

EVESON FOR COAL

ANOTHER REMINDER!

TELEGRAMS: "EVESON, BIRMINGHAM."

NEWBATTLE CANNEL.

Highest Results in Gas, & Excellent Coke.

QUOTATIONS ON APPLICATION TO

THE LOTHIAN COAL COMPANY,

LIMITED,

NEWBATTLE COLLIERIES,

DALKEITH, N.B.

CRESSWELLS' ASBESTOS CO., LTD.
WELLINGTON MILLS
BRADFORD, YORKS.

Asbestos Spinners and Manufacturers.

Telephone No. 950. Tels.: "ASBESTOS, BRADFORD."

If you want **FIREPROOF ASBESTOS BOARDS** or **SHEETS** for Screens or Lining Woodwork, don't mind troubling us for Prices and Samples. Ask for No. 2 Catalogue.

GAS-FIRE FUEL.

Applications for Colonial and Foreign Agencies desired.

JAMES OAKES & CO.

ALFRETON IRON-WORKS, DERBYSHIRE,
AND
Wenlock Iron Wharf, 21 & 22, Wharf Road, CITY ROAD, LONDON, N.,

Manufacture and keep in Stock at their Works (also large stock in London)

PIPES and CONNECTIONS, 1¼ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Makers of **HORSLEY'S PATENT SYPHONS.** These are cast in one piece, without Chaplets; doing away with Bolts, Nuts and Covers, and rendering Leakage impossible.

THOMAS TURTON AND SONS, LIMITED,

SHEAF WORKS, SHEFFIELD,

MANUFACTURERS OF

FILES OF BEST QUALITY FOR ENGINEERS.

STEEL OF ALL DESCRIPTIONS.

SCREW STOCKS, TAPS AND DIES, SPANNERS, RATCHET BRACES, LIFTING JACKS, ANVILS, VICES, AND ENGINEERS' TOOLS GENERALLY.

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90, CANNON STREET, E.C

TROTTER, HAINES, & CORBETT, LIMITED,
Brettell's Estate
FIRE-CLAY & BRICK WORKS,
STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.
Special Lumps, Tiles, and Bricks for Regenerative and Furnace Work.
Shipments Promptly and Carefully Executed.

London Office: R. Cull, 84, Old Broad Street, E.C.

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Gas Companies are solicited to try Samples of the

MIRFIELD
BLACK BED GAS COAL.

Prices and Analysis on application.

MIRFIELD (GAS-COAL) COLLIERY COMPY.
RAVENSTHORPE, NEAR DEWSBURY.

HARDMAN & HOLDEN, Ld.
ESTABLISHED 1820.
SULPHURIC ACID.

MADE from Spent Oxide (free from Arsenic) and of excellent Purity. Specially prepared for Sulphate of Ammonia Manufacturers.

Works: BLACKBURN; Miles Platting and Clayton, MANCHESTER.
Head Office: Miles Platting, MANCHESTER.
Inquiries Solicited.

THE PATENT
"BEACON" GLOBE LAMP.

Largely adopted by many Local Authorities for Public Lighting, being absolutely Shadowless and Wind-proof.

H. GREENE & SONS, Ld.,
Late of Cannon Street,
Works and Show Rooms:
19, Farringdon Road, E.C.
Registered Offices:
36, Mark Lane, E.C.
Telephone: 1215 Holborn. Telegrams: "Luminosity"

Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887, for

CANNEL & COAL.

TYNE
BOGHEAD CANNEL.

Yield of Gas per ton	13,155 cub. ft.
Illuminating Power	38·22 candles.
Coke per ton	1,301·88 lbs.

EAST PONTOP GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	17·8 candles.
Coke	70 per cent.

SOUTH PELAW MAIN GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	73·1 per cent.

For Prices and complete Analysis, apply to
THOS. W. DANCE, SON, & HUNTER,
Coal Owners, Newcastle-on-Tyne;
or
E. FOSTER & CO.,
21, John Street, Adelphi, London, W.C.

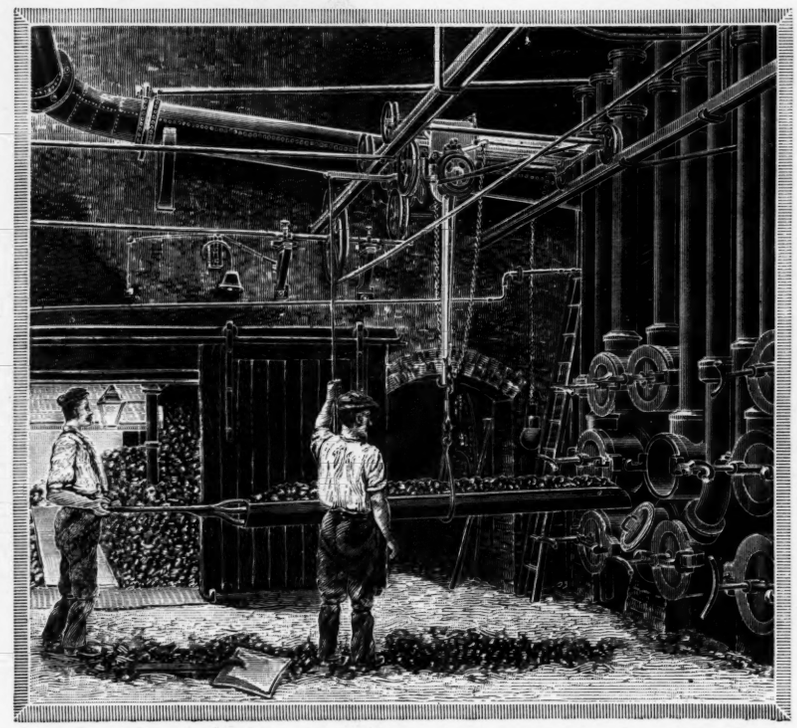
HARRIS & PEARSON,
STOURBRIDGE, ENGLAND.
MANUFACTURERS OF
FIRE-CLAY GAS-RETORTS, FIRE-BRICKS, LUMPS, & TILES of Every Description.
GLAZED BRICKS AND PORCELAIN BATHS.

JAMES MILNE & SON, Ltd.,
GAS ENGINEERS
MILTON HOUSE WORKS EDINBURGH.
LONDON. — LEEDS. — GLASGOW.

MOBBERLEY & PERRY
STOURBRIDGE.
Manufacture & supply best quality of
Gas Retorts (SEGMENTAL, HORIZONTAL, or INCLINED.)
Special Bricks & Blocks for GENERATOR & REGENERATOR FURNACES.
FIRE BRICKS, LUMPS, & TILES, BLUE STAFFORDSHIRE VITRIFIED BRICKS FOR PAVING, &c., &c.
EVERY REQUISITE FOR GAS-WORKS. Retort Setters sent to any part of the Kingdom.
Contractors for the erection of Retort-Benches complete.

London Agents:
BALE & HARDY, Gas Engineers and Contractors,
BRIDGE HOUSE, 181, QUEEN VICTORIA STREET, E.C.

DON'T ADOPT EXPENSIVE MACHINERY



BUT USE THE PATENT

"RAPID" POWER CHARGING APPARATUS

FOR LARGE WORKS.

Can be seen at work by appointment.

Biggs, Wall & Co.

13, CROSS STREET, FINSBURY.
LONDON, E.C.
TELEGRAPHIC ADDRESS:
"RAGOUT, LONDON."

THE

MAXIM PATENT CARBURETTOR

FOR ENRICHING GAS IN BULK.

PREVENTS NAPHTHALENE DEPOSITS.

OVER 100 MAXIM PATENT CARBURETTORS HAVE NOW BEEN FIXED.

Among the Companies and Towns supplied are The Gas Light and Coke Company, The South Metropolitan Gas Company, Birmingham, Leeds, Rochdale, Bristol, Sheffield, Southport, Alloa, Broughty Ferry, Dunfermline, and many other Works, both large and small, where they have been working in some instances for the past **Seven Years.**

MORE GAS & SALEABLE COKE PER TON of COAL CARBONIZED is PRODUCED; SAVING CAPITAL, LABOUR, FUEL, WEAR & TEAR, &c.

THE ENRICHMENT IS INSTANTANEOUS AND PERMANENT.

The Carburettor is inexpensive, easily fixed, and entirely supersedes the use of Cannel.

Dealers in Benzol, Carburine, and all other Naphthas and Oils suitable for the Enrichment or Production of Gas.

For Prices and full Particulars, apply to

THE GAS LIGHTING IMPROVEMENT COMPANY, LIMITED,

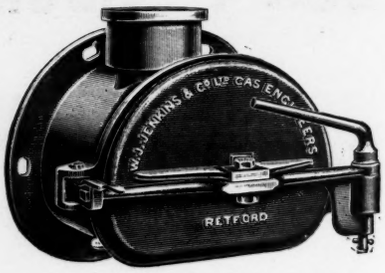
18, DEVONSHIRE STREET, BISHOPSGATE, LONDON, E.C.

MOUTHPIECES

WITH SELF-SEALING LIDS FOR
HORIZONTAL AND INCLINED RETORTS.

SOLE MAKERS OF

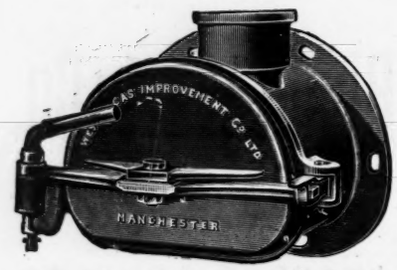
THE "DE BROUWER"
PATENT COKE-CONVEYOR.



W. J. JENKINS & CO., LTD., RETFORD.

WEST'S GAS IMPROVEMENT COMPANY, LTD.

ALBION IRON-WORKS, MILES PLATTING, MANCHESTER;
AND 104, QUEEN VICTORIA STREET, LONDON, E.C.



MAKERS OF **WEST'S MACHINERY** FOR

CHARGING AND DRAWING GAS-RETORTS.

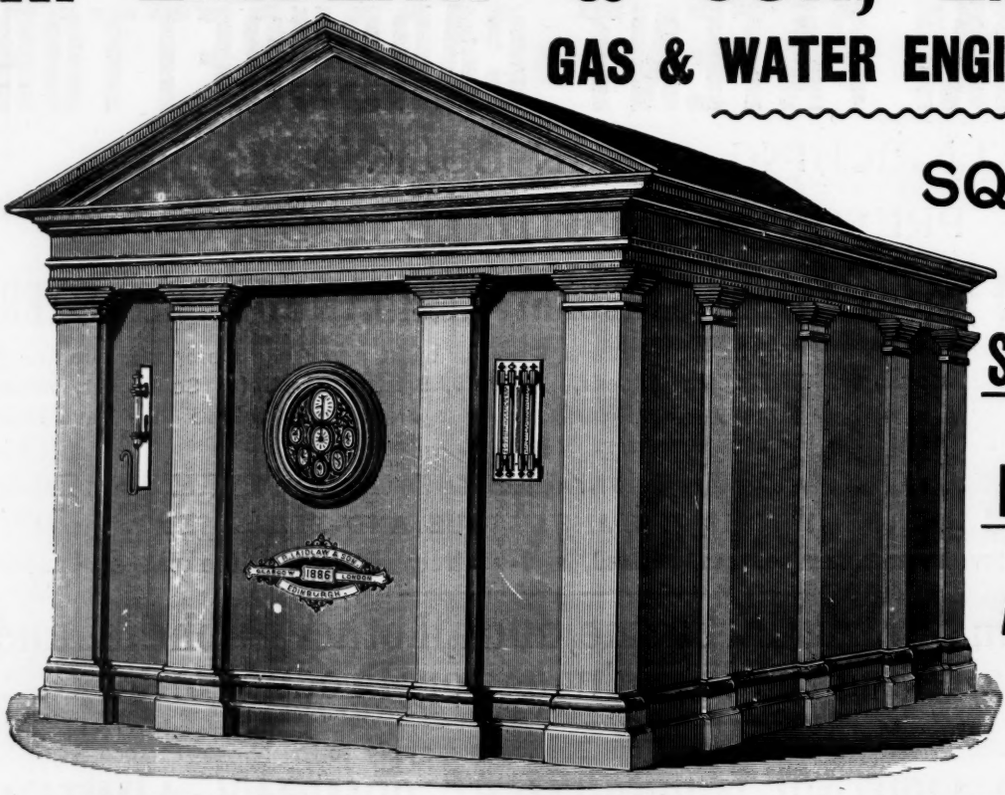
WEST'S PATENT REGENERATOR SETTINGS.

WEST'S PATENT SILENT COKE CONVEYOR.

RETORT MOUTHPIECES WITH SELF-SEALING LIDS.

R. LAIDLAW & SON, LIMITED,

GAS & WATER ENGINEERS.



SQUARE

(OR ROUND)

STATION

METERS

ALL SIZES.

SIMON SQUARE WORKS, EDINBURGH. | ALLIANCE FOUNDRY, GLASGOW. | 6, LITTLE BUSH LANE, LONDON.

THE DELLWIK-FLEISCHER WATER-GAS PROCESS

For Increasing the Capacity of Coal-Gas Works, also for Incandescent Lighting, Driving of Gas-Engines, and Manufacturing Purposes.

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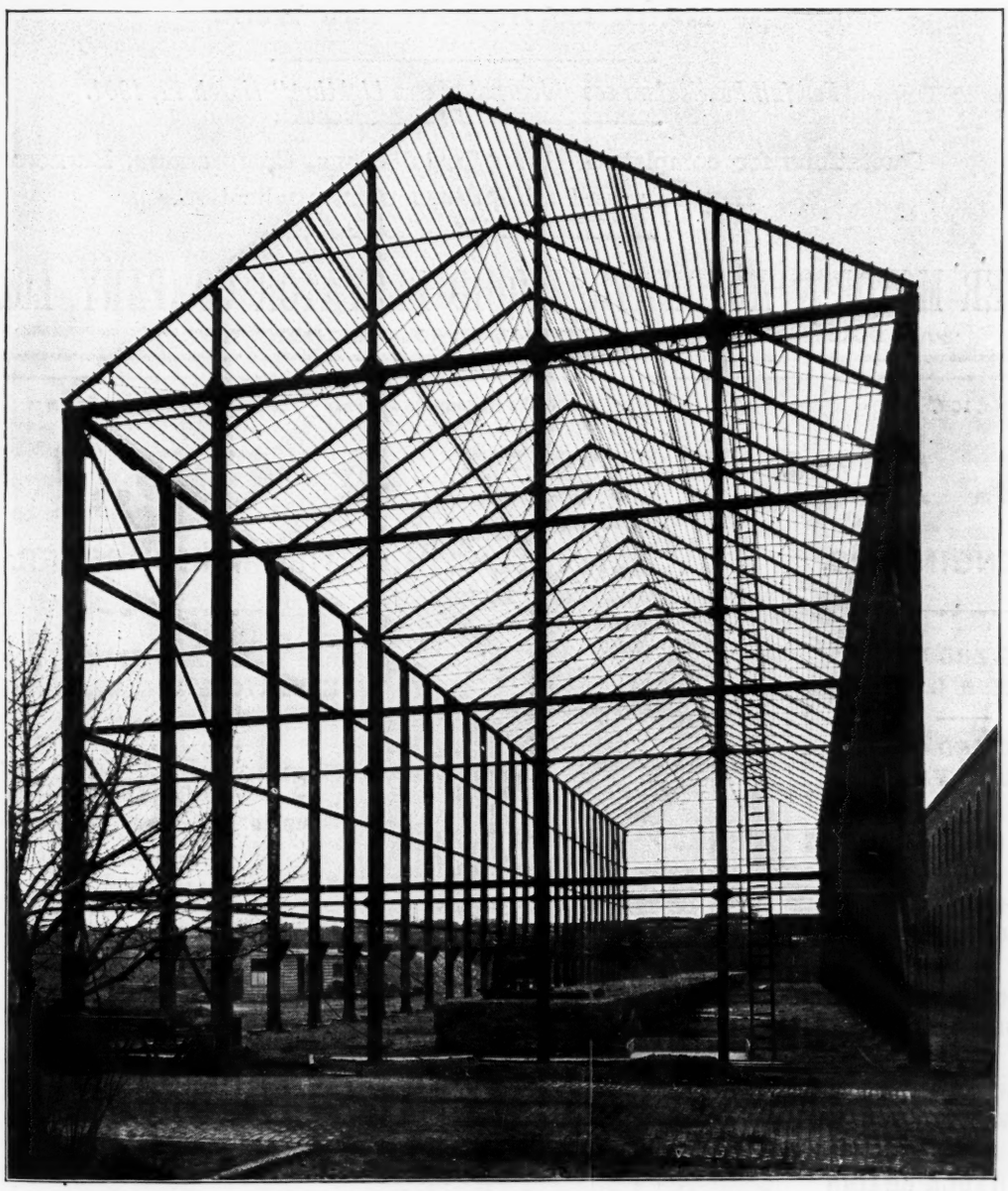

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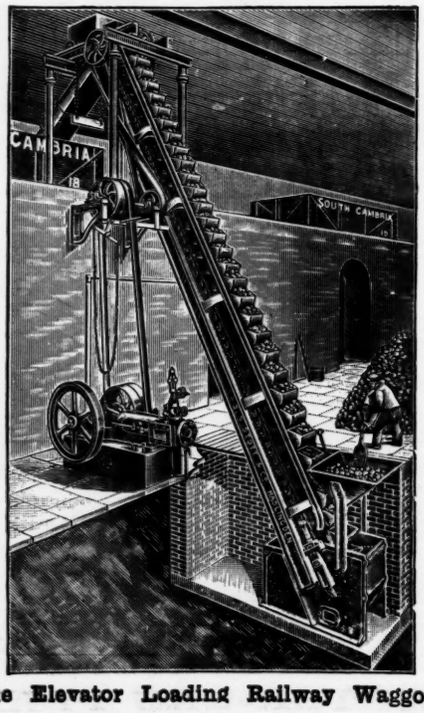

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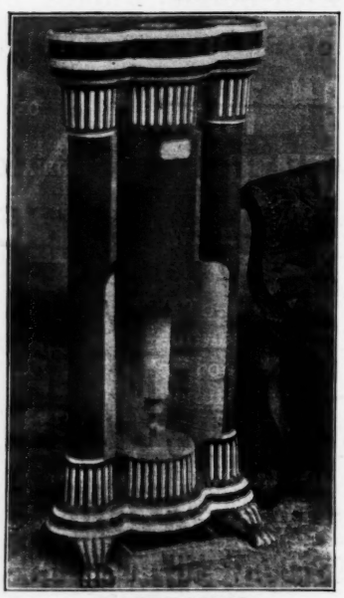

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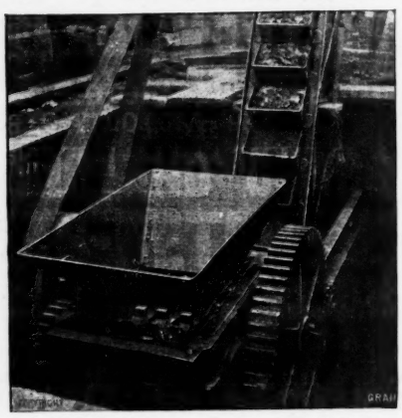

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PHOTO, SHOWING ELEVATOR FOR COLD COKE.

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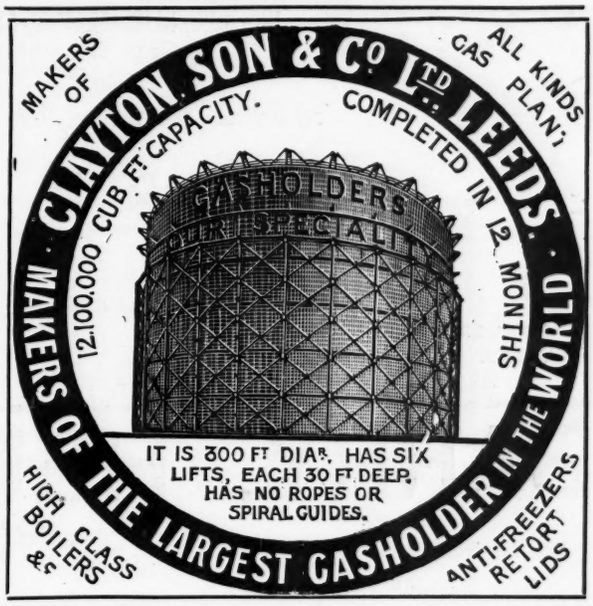
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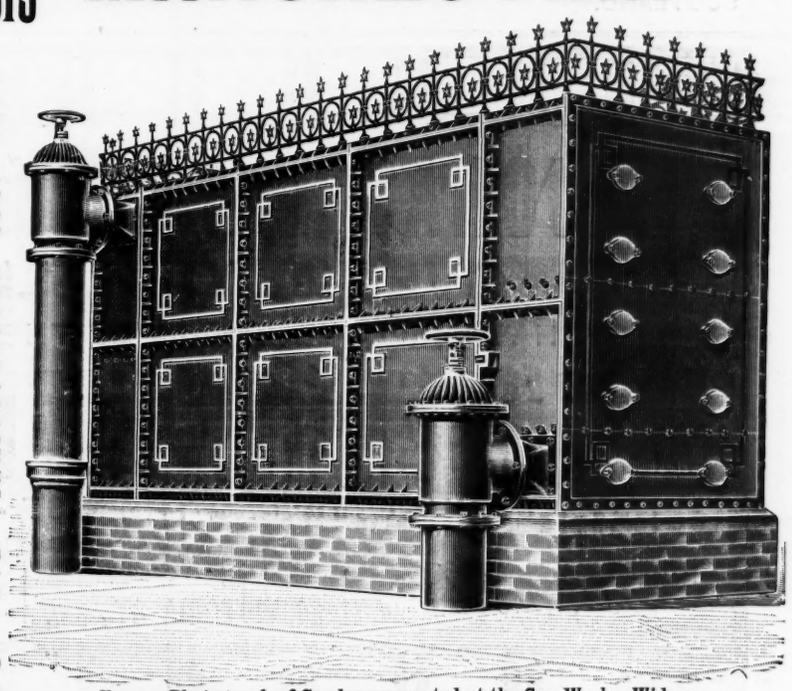
Condensers of this type equal to 10,500,000 cubic feet per 24 hours already erected and at work.



From a Photograph of Condenser erected at the Gas-Works, Widnes.
Capacity 1,500,000 cubic feet per 24 hours.

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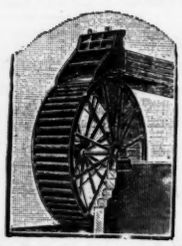

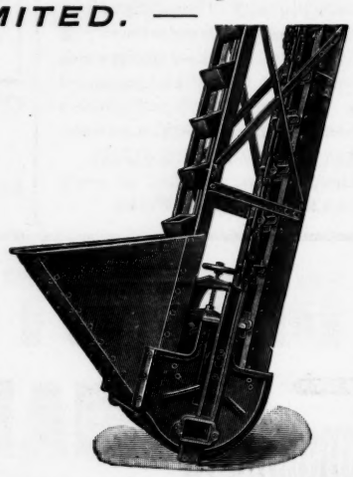

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